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PUBLIC HEALTH REPORTS

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UNDERGRADUATE ENGINEERING TRAINING IN PUBLIC HEALTH AND RELATED ACTIVITIES IN ENGINEERING COLLEGES OF THE UNITED STATES

By ARTHUR P. MILLER, *Sanitary Engineer, United States Public Health Service*

Numerous inquiries concerning sanitary engineering training facilities in engineering colleges of the United States, stimulated the collection and tabulation of data on the subject in 1924.[1] To keep this material current, these data were revised in 1929.[2] Changing curricula and the extension of this type of training into other colleges indicated the desirability of securing new information on this subject. In presenting this revised material, the method used in the previous publications has been followed closely for the sake of consistency and to permit comparisons. The one major deviation is that the data given here refer only to undergraduate courses covering 4 years. Course data and other figures applicable only to post-graduate workers have been excluded.

METHOD OF COLLECTING INFORMATION

Preliminary circular letters were sent to 126 engineering colleges, the names of which were secured from a list published by the United States Office of Education. This circular letter asked that the receiving college official indicate either affirmatively or negatively the college's position with respect to the following three classifications:

(1) Those offering undergraduate work in sanitary or public health engineering which leads to a degree distinct from that secured from civil engineering studies.

(2) Those offering undergraduate work in sanitary or public health engineering as major courses of study under civil engineering.

(3) Those offering graduate work of a specialized character in the sanitary or public health engineering fields.

To this circular letter, 123 replies were received. On the basis of these replies, those colleges falling within the first two classifications were selected and supplied with forms upon which they might submit

[1] Public Health Reports, 39: 1989-1997. (Reprint No. 945.)
[2] Public Health Reports, 44: 637-645. (Reprint No. 1273.)

detailed data concerning their sanitary engineering courses as of the college year 1936–37. In many cases, it was not possible to determine from the information supplied under what classification a particular college should be placed. In these instances, the opportunity was given for the college officers to establish the classification of the institution by supplying them with forms applicable to both classes 1 and 2. In other words, where there was any doubt as to the proper classification, the decision was made by the correspondent in that college through the selection of the most suitable form upon which to make the report.

After the tabulation of the information presented in tables 1 and 2, copies of the tentative compilations were sent to the colleges supplying the figures for checking and revision. Therefore, in the main, these data should be correct. It must be conceded, however, that in working with many persons having different opinions as to course and subject classification, the opportunities for slight errors in judgment and in the arrangement of the material are numerous.

SUBJECT MATTER IN COURSE

In table 1, there are shown the various subjects given in sanitary and public health engineering courses in 25 colleges. One college, the Massachusetts Institute of Technology, is represented by 2 courses. The division of subjects and subject groups follows very closely that used in the preceding reports previously mentioned. All colleges have been grouped together, and no attempt has been made to differentiate between those having degree courses and those having optional courses. This distinction is fairly well made in the column showing the degrees offered.

By comparing the list of colleges giving undergraduate training in this subject today with the similar one compiled in 1929[3] it is found that 13 colleges are now in this particular educational field which were not included in 1929 and that 7 colleges shown in the 1929 report are not now included. The net increase in the number of colleges giving training to those wishing to engage in this type of work apparently represents a healthy growth. It is well known that public health work and the design and construction of works essential to improving environmental sanitation have both expanded in recent years. The demand for men trained to engage in activities related to these two growing fields has naturally increased also, and to provide the needed personnel the number of training centers has grown.

Within the limits of the accuracy of the reports on curricula data, each course is set forth in table 1. There are no two courses exactly alike, indicating that our educational institutions follow no stereotyped

[3] Reference in footnote 2

schedule. Probably the course given at each college reflects, in a large measure, the opinions of the authorities as to the needs of the students.

The totals of percentages of time devoted to subject groups are more susceptible of comparison than the figures for the individual

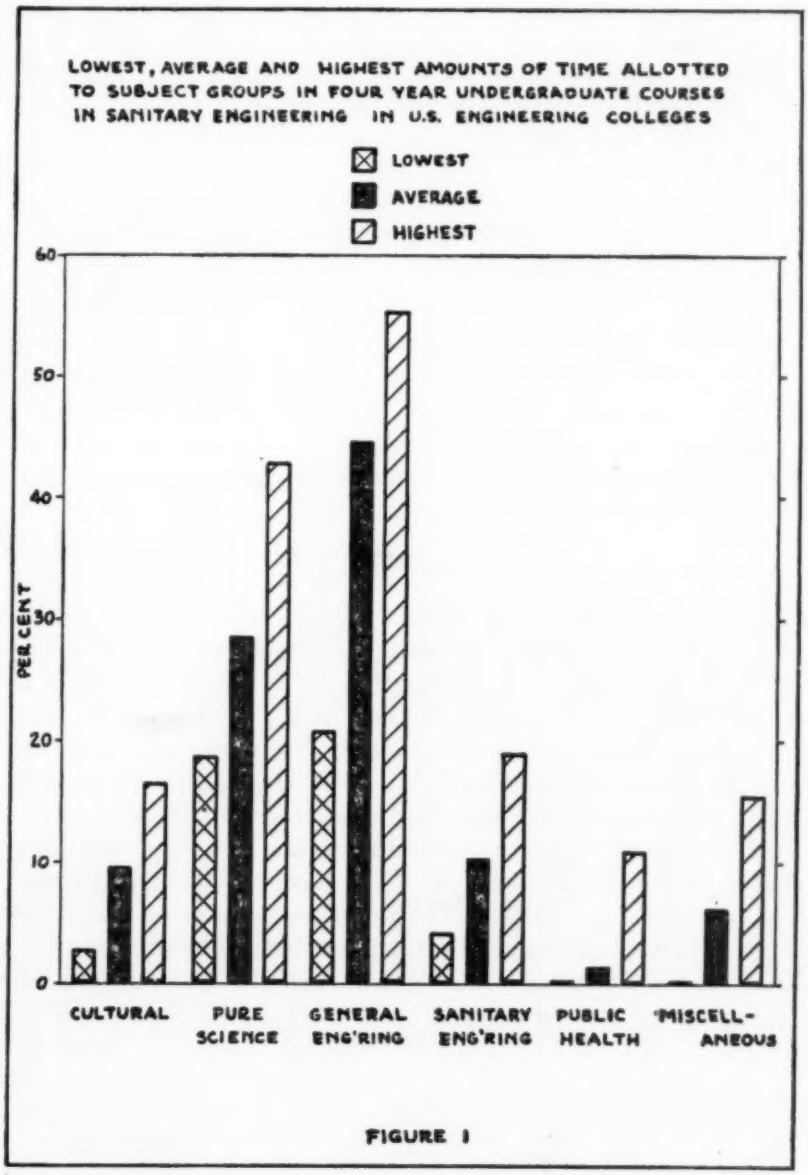

FIGURE 1

subjects. Figure 1 shows for each subject group the rather wide spread between the least and greatest amounts of time allotted to each group. The average for each subject group as shown in this figure

is given below, in comparison with similar figures secured from the 1929 data.

	Average percentages of time allotted to subject groups	
	1936–37	1929
Cultural	9.5	14.2
Pure science	28.3	26.9
General engineering	44.5	43.5
Sanitary engineering	10.3	12.1
Public health	1.2	.7
Miscellaneous	6.1	2.7

It is interesting to note that the civil engineering courses of 45 additional colleges include sanitary engineering subjects which require from 2.5 percent to 8.4 percent of the student's time and that similar curricula in 19 other colleges demand that the student devote 2.5 percent or less of his time to subjects of primary importance to sanitary engineers.

GEOGRAPHICAL DISTRIBUTION OF COLLEGES

The distribution of the colleges included in this study is quite even geographically, as shown in figure 2. Except for the Rocky Mountain States, a college with a sanitary engineering course is fairly assessible to persons in all parts of the country.

NUMBER OF GRADUATES

Generally speaking, it can be said that many students are inclined to elect courses which will train them for fields in which they are most likely to find positions after graduation. The enlarging field of sanitary and public health engineering has, no doubt, influenced many to train for it. Table 2 gives the number of graduates annually from 4-year undergraduate courses in sanitary engineering from 1889 to 1938, and figure 3 shows these figures graphically. There was apparently a definite upward trend up to 1916, when this trend was checked, probably by the World War. In 1927, however, this trend again set in and continued up to 1934, when the rise was quite sharp. Whether this rise will continue cannot be predicted, but at the present time the outlook for those trained in problems relating to the sanitation of our environment appears to be good.

TABLE 1.—*Percent of time allotted to subject*

Numerical order	College	(1) Cultural									(2) Pure science										
		a	b	c	d	e	f	g	h	i	a	b	c	d	e	f	g	h	i	j	a
		Citizenship	Economics	English	History	Languages	Law	Public speaking	Electives	Miscellaneous	Astronomy	Bacteriology	Biology	Chemistry	Geology	Mathematics	Mineralogy	Physics	Zoology	Botany	Contracts—Specifications
1	Alabama Polytechnic Institute	1.5	1.5	3.0	2.0		1.5	1.0			2.5	3.0	1.0	5.0		10.0		6.0			.5
2	California, University of								7.1		1.0	1.4		7.7	1.4	5.7		9.6	1.4		1
3	Case School of Applied Science		2.5	5.0	2.5			1.2			1.2			5.8	1.2	7.5		7.1			
4	Cornell University		1.3	1.3				1.3				2.5	1.5	6.3	2.9	4.2		5.5			1.3
5	Illinois, University of			5.5					2.1			2.1		5.5	2.1	12.5		7.0			
6	Iowa State College of Agriculture and Mechanic Arts	1.0	1.8	2.7				1.5	2.4	.3		1.5		6.4	1.5	7.9		5.4			.9
7	Iowa, State University of		2.1	7.2				.9		3.7				7.2	1.2	12.6		3.6			1.4
8	Kansas, University of			4.3			.5		2.4		1.4	3.8		6.1	2.4	9.4		6.6			.9
9	Maine, University of		6.7	5.3				2.7		1.0	1.7	3.3		5.3	3.3	12.0		8.0			
10	Massachusetts Institute of Technology		2.5	3.5	1.3				3.5				2.1	14.3		5.0		9.6			
11	Do.		2.5	3.5	1.3				3.1			5.0	4.2	15.1		5.0		9.6			
12	Michigan State College of Agriculture and Applied Science		1.5	4.4				1.5				3.9		5.9	1.5	13.3		7.4			1.5
13	Michigan, University of		4.1	6.2				2.0	4.1					5.5	2.8	11.0		6.9			1.4
14	New York University		2.4	4.9	1.0		1.0	3.0						7.7	4.9	6.5		6.8			2.9
15	North Carolina State College of Agriculture and Engineering		3.0	6.1		1.0	1.0					2.0	.7	5.0	1.4	10.1		5.0			
16	Oklahoma Agricultural and Mechanical College		1.3	5.1				.9				3.4		5.1	2.5	7.6		5.9			.9
17	Pennsylvania State College		1.0	3.4					4.1			3.0		7.1	1.9	5.5	3.0	4.4	1.5	1.1	.7
18	Purdue University		3.6	5.4				1.8	5.4			4.8		9.6	1.2	10.8		4.8			1.8
19	Rutgers University			2.8								5.6		12.2	2.4	7.5		5.6	5.2		
20	South Carolina, University of		3.1	6.2								3.1	2.6	17.6		12.4		7.2			
21	Texas, Agricultural and Mechanical College of	1.3	2.6	4.4				1.3						5.1		7.7		6.0			.9
22	Texas, University of	2.3	2.3	9.1				1.5				2.3		9.1	2.3	11.3		9.1			
23	Virginia Polytechnic Institute		1.6	4.9				.8				1.9		5.7	2.5	7.4		6.6			.6
24	Washington, University of		1.1	1.1			1.1	1.1						5.3	2.1	6.3		6.3			
25	West Virginia University		2.0	2.9			1.2					2.0		8.1	2.4	7.8		4.9			
26	Wisconsin, University of		1.8	4.5								4.1		7.2	2.3	8.1		8.1			.9

TABLE 1.—*Percent of time allotted to subjects in 4-yea*

Cultural					(2) Pure science												
e	f	g	h	i	a	b	c	d	e	f	g	h	i	j	a	b	c
Languages	Law	Public speaking	Electives	Miscellaneous	Astronomy	Bacteriology	Biology	Chemistry	Geology	Mathematics	Mineralogy	Physics	Zoology	Botany	Contracts—Specifications	Costkeeping—Management	Engineering drawing
	1.5	1.0			2.5	3.0	1.0	5.0		10.0		6.0			.5	2.5	4.5
			7.1		1.0	1.4		7.7	1.4	5.7		9.6	1.4		1.0		3.4
		1.2			1.2			5.8	1.2	7.5		7.1				1.3	7.5
		1.3				2.5	1.5	6.3	2.9	4.2		5.5			1.3		11.0
			2.1			2.1		5.5	2.1	12.5		7.0			1.4		5.5
		1.5	2.4	.3		1.5		6.4	1.5	7.9		5.4			.9	2.4	7.3
		.9		3.7				7.2	1.2	12.6		3.6			1.4		5.0
	.5		2.4		1.4	3.8		6.1	2.4	9.4		6.6			.9		8.0
		2.7		1.0	1.7	3.3		5.3	3.3	12.0		8.0					4.0
			3.5				2.1	14.3		5.0		9.6				1.7	5.8
			3.1			5.0	4.2	15.1		5.0		9.6					5.7
		1.5				3.9		5.9	1.5	13.3		7.4			1.5		5.9
		2.0	4.1					5.5	2.8	11.0		6.9			1.4		5.5
	1.0	3.0						7.7	4.9	6.5		6.8			2.9		5.8
1.0	1.0					2.0	.7	5.0	1.4	10.1		5.0				1.0	8.7
		.9				3.4		5.1	2.5	7.6		5.9			.9	1.3	5.9
			4.1			3.0		7.1	1.9	5.5	3.0	4.4	1.5	1.1	.7		7.0
		1.8	5.4			4.8		9.6	1.2	10.8		4.8			1.8		3.6
						5.6		12.2	2.4	7.5		5.6	5.2				6.1
						3.1	2.6	17.6		12.4		7.2					7.8
		1.3						5.1		7.7		6.0			.9		6.9
		1.5				2.3		9.1	2.3	11.3		9.1					4.5
		.8				1.9		5.7	2.5	7.4		6.6			.6		8.2
	1.1	1.1						5.3	2.1	6.3		6.3					6.3
	1.2					2.0		8.1	2.4	7.8		4.9					9.8
						4.1		7.2	2.3	8.1		8.1			.9		8.1

cts in 4-year undergraduate courses in sanitary engineering in United States engineering colleges as of 1936–37

(3) General engineering																			(4) Sanitary engineering						(5) Public health			(6) Miscellaneous			(7) Total			
	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	a	b	c	d	e	f	a	b	c	a	b	c	a	b	c	d
	Costkeeping—Management	Engineering drawing	Electrical engineering	Engineering discussion	Heat engineering	Hydraulics	Industrial engineering	Materials	Mechanics	Public utilities engineering	Railroad engineering	Roads—Pavements	Shop work	Structures	Surveying	Water power	Cement—Masonry—Concrete	Hydrology	Municipal sanitation	Sanitary laboratory	Sewerage—Sewage disposal	Waterworks—Water treatment	Sanitary design—Engineering	Thesis	Sanitary science—Public Health	Vital statistics	Miscellaneous	Physical education	Military science—Drill	Nonclassified	Cultural	Pure science	General engineering	Sanitary engineering
	2.5	4.5		1.5	1.5	1.5	1.0	3.5	4.0	0.5	1.5	4.5	2.0	4.5	7.5	1.5			1.0	3.0	2.0	2.0			1.0	0.5		2.0	8.0		10.5	27.5	42.5	8.0
1.0		3.4				2.4		7.7	2.9			1.0		13.4	7.2				1.0	8.5	1.9	1.9		5.7	1.0				5.7		7.1	28.2	39.0	19.0
	1.3	7.5	1.3		1.3	4.6	4.6				1.3	2.5		18.1	6.2			1.2		1.5	2.5	2.5	2.5	3.8				3.3			11.2	22.8	49.9	12.8
		11.6		1.3	1.3	2.3		4.4	3.8		2.5	1.3	1.1	8.0	12.0		4.4			2.1	4.4	2.1	2.5		1.3			.8	4.2		3.9	22.9	55.3	11.1
1.4		5.5	2.1		2.1	2.1		6.3	3.5			2.8		13.2	7.0		2.1			1.4	2.8	4.2			2.1		1.4	1.4	2.8		7.6	29.2	48.1	8.4
	2.4	7.3				1.8		2.1	5.5		4.8	3.3		10.9	5.8	1.5	1.5	1.5			5.1	3.6							4.5	5.1	9.7	22.7	49.3	8.7
		5.0	3.6	2.8	3.6	2.8		2.8	2.8	1.4	4.2	2.1		10.7	4.2				2.1	2.8	3.6	2.8							2.8		13.9	24.6	47.4	11.3
		8.0	2.4	1.4		2.8		5.7	4.2		2.8	2.4		12.3	8.5		2.4	.9		.9	1.4	5.2			.9						7.2	29.7	54.7	7.5
		4.0	3.7			2.7		3.0	6.7			3.3		10.0	8.0				1.3		2.0	1.3						4.7		15.7	33.6	41.4	4.6
	1.7	5.8	2.5		1.7	2.5		.8	2.5		.8			4.4	7.1		3.8			7.5	1.4	1.4	3.5	3.5				.8	5.0		10.8	31.0	33.6	17.3
		5.7				1.7			2.5					3.1	7.9				1.7	4.6	1.4	1.4	3.5	*5.0	1.7	.8	4.7	.8	5.0		10.4	38.9	20.9	17.6
		5.9		1.0		4.0			7.9			1.0	3.0	10.0	6.4					3.5	5.0	3.5	2.5					1.5	4.4		7.4	32.0	40.7	14.5
		5.5	2.8		2.7	3.4		2.8	7.5	1.4	1.4	1.4	1.4	4.2	4.7	1.4	2.1	2.1	2.1		3.5	3.5	2.1								16.4	26.2	46.2	11.2
		5.8	2.4		1.7	2.4	1.0	1.5	6.1			2.9		12.4	5.3					3.4	1.5	3.4			2.4			5.8	1.0		12.3	25.9	44.4	8.3
1.0		8.7	2.7		1.0	2.0		4.7	3.0			2.0	2.0	5.7	9.1		1.0		1.0	2.7	2.0	2.0						4.0	10.1		11.1	24.2	42.9	7.7
1.3		5.9	3.4	.9	2.5	2.1		2.1	5.1		2.1	.9		13.6	11.4		.4		2.1	2.5	1.7	2.1	2.1						5.1		7.3	24.5	52.6	10.5
		7.0		2.3	1.8	1.8		5.8			1.4	.7		11.8	15.7						2.1	2.0			.7			4.4	5.8		8.5	27.5	49.0	4.1
		3.6	2.4	.6	2.4	2.6		1.8	4.8			1.8	1.2	11.6	7.2				2.6		1.2	1.2		1.8					4.0		16.2	31.2	41.8	6.8
		6.1	1.4	1.4	1.4	2.8		5.6	5.2		2.4			4.2	4.7					4.7	3.3	4.7	.9					5.6		4.2	2.8	38.5	35.2	13.6
		7.8			3.1	1.6		3.1	3.1					4.7	2.6	1.6			1.6	2.7	1.6	3.6			6.2	1.6	3.1				9.3	42.9	27.6	9.5
		6.9	2.6	2.7	1.3	2.2		2.6	3.6		1.8	2.6		7.7	8.8		4.8			2.6	1.3	1.3	2.6		1.3			1.8	10.9	1.3	9.6	18.8	48.5	7.8
		4.5	3.0		3.0	2.3		5.3	4.5		2.3	1.5		6.8	10.6						2.3	2.3	2.3								15.2	34.1	43.8	6.9
		8.2	1.6	1.9	.8	2.5		1.9	3.3		3.0	1.6		7.4	9.0	.8	2.7			5.2	1.4	1.4							14.7	.6	7.3	24.1	45.3	8.0
		6.3	4.2		1.1	7.4		3.5	8.4			2.1		14.7	5.0	1.8				2.1	2.1	2.1	2.1			.7	3.5	6.3		4.4	20.0	54.5	8.4
		9.8	2.4	2.0	2.4	2.0		.8	5.3		1.2	1.2		11.1	10.6				.8	7.0	2.8	2.8						1.6	4.9		6.1	25.2	48.8	13.4
		8.1	2.3		2.7	2.7		2.7	4.5		6.8	1.4		8.1	12.2			.9		1.8	2.7	1.4		3.6				1.4			6.3	29.8	53.3	9.5

United States engineering colleges as of 1936–37

							(4) Sanitary engineering						(5) Public health			(6) Miscella	
m	n	o	p	q	r	s	a	b	c	d	e	f	a	b	c	a	b
Roads—Pavements	Shop work	Structures	Surveying	Water power	Cement — Masonry — Concrete	Hydrology	Municipal sanitation	Sanitary laboratory	Sewerage—Sewage disposal	Waterworks—Water treatment	Sanitary design—Engineering	Thesis	Sanitary science—Public Health	Vital statistics	Miscellaneous	Physical education	Military science—Drill
4.5	2.0	4.5	7.5	1.5			1.0	3.0	2.0	2.0			1.0	0.5		2.0	8.0
1.0		13.4	7.2				1.0	8.5	1.9	1.9		5.7	1.0				5.7
2.5		18.1	6.2			1.2		1.5	2.5	2.5	2.5	3.8				3.3	
1.3	1.1	8.0	12.0		4.4			2.1	4.4	2.1	2.5		1.3			.8	4.2
2.8		13.2	7.0		2.1			1.4	2.8	4.2			2.1		1.4	1.4	2.8
3.3		10.9	5.8	1.5	1.5	1.5			5.1	3.6							4.5
2.1		10.7	4.2				2.1	2.8	3.6	2.8							2.8
2.4		12.3	8.5		2.4	.9		.9	1.4	5.2			.9				
3.3		10.0	8.0				1.3		2.0	1.3							4.7
		4.4	7.1		3.8			7.5	1.4	1.4	3.5	3.5				.8	5.0
		3.1	7.9				1.7	4.6	1.4	1.4	3.5	*5.0	1.7	.8	4.7	.8	5.0
1.0	3.0	10.0	6.4					3.5	5.0	3.5	2.5					1.5	4.4
1.4	1.4	4.2	4.7	1.4	2.1	2.1	2.1		3.5	3.5	2.1						
2.9		12.4	5.3					3.4	1.5	3.4			2.4			5.8	1.0
2.0	2.0	5.7	9.1		1.0		1.0	2.7	2.0	2.0						4.0	10.1
.9		13.6	11.4		.4		2.1	2.5	1.7	2.1	2.1						5.1
.7		11.8	15.7						2.1	2.0			.7			4.4	5.8
1.8	1.2	11.6	7.2				2.6		1.2	1.2		1.8					4.0
		4.2	4.7					4.7	3.3	4.7	.9					5.6	
		4.7	2.6	1.6			1.6	2.7	1.6	3.6			6.2	1.6	3.1		
2.6		7.7	8.8		4.8			2.6	1.3	1.3	2.6		1.3			1.8	10.9
1.5		6.8	10.6						2.3	2.3	2.3						
1.6		7.4	9.0	.8	2.7			5.2	1.4	1.4							14.7
2.1		14.7	5.0	1.8				2.1	2.1	2.1	2.1				.7	3.5	6.3
1.2		11.1	10.6				.8	7.0	2.8	2.8						1.6	4.9
1.4		8.1	12.2			.9		1.8	2.7	1.4		3.6				1.4	

(6) Miscellaneous			(7) Total						Degree offered	Numerical order
a	b	c	a	b	c	d	e	f		
Physical education	Military science—Drill	Nonclassified	Cultural	Pure science	General engineering	Sanitary engineering	Public health	Miscellaneous		
2.0	8.0		10.5	27.5	42.5	8.0	1.5	10.0	B. S. in C. E.	1
	5.7		7.1	28.2	39.0	19.0	1.0	5.7	B. S. in Engineering.	2
3.3			11.2	22.8	49.9	12.8		3.3	B. S. in C. E.	3
.8	4.2		3.9	22.9	55.3	11.1	1.3	5.0	B. C. E.	4
1.4	2.8		7.6	29.2	48.1	8.4	3.5	4.2	B. S. in C. E.	5
	4.5	5.1	9.7	22.7	49.3	8.7		9.6	B. S. (C. E.).	6
	2.8		13.9	24.6	47.4	11.3		2.8	B. S. in C. E.	7
			7.2	29.7	54.7	7.5	.9		B. S. in C. E. (Sanitary).	8
	4.7		15.7	33.6	41.4	4.6		4.7	B. S.	9
.8	5.0		10.8	31.0	33.6	17.3		5.8	S. B. in C. E.	10
.8	5.0		10.4	38.9	20.9	17.6	7.2	5.8	S. B. in Public Health Engineering.	11
1.5	4.4		7.4	32.0	40.7	14.5		5.9	B. S. in C. E.	12
			16.4	26.2	46.2	11.2			B. S. E. (C. E.).	13
5.8	1.0		12.3	25.9	44.4	8.3	2.4	6.8	B. S. in C. E. (Sanitary).	14
4.0	10.1		11.1	24.2	42.9	7.7		14.1	Do.	15
	5.1		7.3	24.5	52.6	10.5		5.1	B. S. in C. E. (Municipal Option).	16
4.4	5.8		8.5	27.5	49.0	4.1	.7	10.2	B. S. in Sanitary Engineering.	17
	4.0		16.2	31.2	41.8	6.8		4.0	B. S. in C. E.	18
5.6		4.2	2.8	38.5	35.2	13.6		9.8	B. S. in Sanitary Engineering.	19
			9.3	42.9	27.6	9.5	10.9		B. S. in C. E. (Public Health Engineering).	20
1.8	10.9	1.3	9.6	18.8	48.5	7.8	1.3	14.0	B. S.	21
			15.2	34.1	43.8	6.9			B. S. in C. E.	22
	14.7	.6	7.3	24.1	45.3	8.0		15.3	Do.	23
3.5	6.3		4.4	20.0	54.5	8.4	.7	9.8	Do.	24
1.6	4.9		6.1	25.2	48.8	13.4		6.5	B. S. in C. E. (Sanitary).	25
1.4			6.3	29.8	53.3	9.5		1.4	B. S. in C. E.	26

	Institution					
1	Alabama Polytechnic Institute	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	California, University of					
3	Case School of Applied Science					
4	Cornell University					
5	Illinois, University of					
6	Iowa State College of Agriculture and Mechanic Arts					
7	Iowa, State University of					
8	Kansas, University of					
9	Maine, University of					
10	Massachusetts Institute of Technology					
11	Do.					
12	Michigan State College of Agriculture and Applied Science					
13	Minnesota, University of					
14	New York University					
15	North Carolina State College of Agriculture and Engineering					
16	Oklahoma Agricultural and Mechanical College					
17	Pennsylvania State College					
18	Purdue University					
19	Rutgers University					
20	South Carolina, University of					
21	Texas, Agricultural and Mechanical College of					
22	Tulane University of					
23	Virginia Polytechnic Institute					
24	Washington, University of					
25	West Virginia University					
26	Wisconsin, University of					

TABLE 2.—*Number of graduates annually from 4-year undergraduate courses in sanitary engineering in United Stat*

Numerical order	College	Year																												
		188-	189-										19-																	
		9	0	1	2	3	4	5	6	7	8	9	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	1
1	Alabama Polytechnic Institute																													
2	California, University of																	6	20	16	2	5	2	0	2	2	3	2	2	
3	Case School of Applied Science [1]																													
4	Cornell University																					1	18	5	14	16	6	5	5	
5	Illinois, University of						1	0	0	1	1	1	2	1	1	1	3	2	5	0	2	6	4	6	5	5	7	9	5	
6	Iowa State College of Agriculture and Mechanic Arts																												4	
7	Iowa, State University of																													
8	Kansas, University of																								1	7	6	0	3	
9	Maine, University of																													
10	Massachusetts Institute of Technology [2]				6	0	3	4	4	4	3	1	4	4	7	6	2	5	6	3	2	9	12	15	14	15	19	12	18	
11	Do.[3]																													
12	Michigan State College of Agriculture and Applied Science																													
13	Michigan, University of																									12	13	23	25	
14	New York University																													
15	North Carolina State College of Agriculture and Engineering																													
16	Oklahoma Agricultural and Mechanical College																													
17	Pennsylvania State College																				3	3	7	11	5	8	6	6	8	
18	Purdue University [4]																													
19	Rutgers University																													
20	South Carolina, University of																													
21	Texas, Agricultural and Mechanical College of																													
22	Texas, University of																			1	0	0	0	0	0	0	0	0	0	
23	Virginia Polytechnic Institute																													
24	Washington, University of																													
25	West Virginia University																										0	1	0	
26	Wisconsin, University of																													
I	Carnegie Institute of Technology																							2	0	2	0	1	0	
II	Columbia University [4]	2	0	0	0	0	0	0	0	0	0	0	[7] 0																	
III	Harvard University																												5	
IV	Lehigh University																													
V	Pittsburgh, University of [7]																										2	3	3	
	Total	2	0	0	6	0	4	4	4	5	4	2	6	5	8	7	5	13	31	20	9	24	43	39	41	67	62	62	78	

[1] Hydraulic and sanitary engineering option in civil engineering.
[2] Sanitary engineering course.
[3] Public health engineering course.
[4] Also, 10 (1937) and 9 (1938) men graduated in evening division which ordinarily requires more than 4 years.

tes annually from 4-year undergraduate courses in sanitary engineering in United St

	Year																									
	189–							19–																		
	4	5	6	7	8	9	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16			
												6	20	16	2	5	2	0	2	2	3	2	2			
																1	18	5	14	16	6	5	5			
	1	0	0	1	1	1	2	1	1	1	3	2	5	0	2	6	4	6	5	5	7	9	5			
																							4			
																			1	7	6	0	3			
	3	4	4	4	3	1	4	4	7	6	2	5	6	3	2	9	12	15	14	15	19	12	18			
																				12	13	23	25			
															3	3	7	11	5	8	6	6	8			
														1	0	0	0	0	0	0	0	0	0			
																					0	1	0			
																		2	0	2	0	1	0			
	0	0	0	0	0	0	[7]0																5			
																					2	3	3			
	4	4	4	5	4	2	6	5	8	7	5	13	31	20	9	24	43	39	41	67	62	62	78			

in civil engineering.

n evening division which ordinarily requires more than 4 years.

19-																										Numerical order
14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	
														8	8	7	8	6	3	5	3	7	6	10	1
3	2	2	5	1	1	1	2	1	1	4	6	1	2	1	4	7	6	2	6	10	19	12	8	13	2
																					5	3	3	2	3
6	5	5	5	3	2	1	2	2	0	2	4	2	4	4	5	1	0	6	2	3	3	2	0	0	4
7	9	5	8	[1]	4	2	2	2	2	5	3	6	1	6	8	3	6	3	4	6	2	2	1	6	5
		4	5	3	0	4	5	6	8	6	6	4	4	3	0	0	1	3	3	2	7	6	5	5	6
									5	8	13	6	12	12	5	3	4	2	5	6	5	2	11	7	7
6	0	3	2	0	3	0	3	3	0	3	3	0	3	4	3	2	4	2	2	3	4	2	3	1	8
														4	5	9	6	9	9	12	7	8	4	0	9
19	12	18	17	5	6	2	3	7	3	1	0	2	3	5	6	4	2	4	2	5	1	2	1	2	10
																0	0	1	1	0	2	4	3	1	11
														0	1	4	1	2	1	6	6	3	2	2	12
3	23	25	20	12	7	9	12	6	9	18	12	9	7	8	5	7	3	10	4	9	5	9	3	7	13
																				16	9	16	[4] 14	[4] 16	14
																	1	6	4	4	5	1	1	1	15
												0	3	3	5	2	3	2	4	5	5	2	0	1	16
6	6	8	4	0	1	5	1	6	2	3	3	0	2	4	5	8	5	5	8	2	4	0	2	1	17
																				4	8	2	3	2	18
													1	2	0	4	1	0	1	1	1	3	1	2	19
																								([6])	20
												9	8	5	8	9	8	8	10	8	4	9	5	8	21
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	3	0	3	0	3	1	1	22
																4	6	3	4	4	3	6	5	9	23
														5	4	6	5	6	8	6	3	10	9	12	24
0	1	0	0	0	0	0	0	0	1	0	0	0	2	0	4	3	1	4	6	2	7	5	1	2	25
																				6	10	8	[6]	4	26
0	1	0	0	1	[7] 1	0	1																		I
				[8] 0	0	0	0	0	0	0	1	0	0	[7] 0											II
		5	2	3	5	1	0	[7] 4	2	1	0	0	1												III
																			0	0	0	[7] 1	0	0	IV
2	3	3	1	1	1	1																			V
2	62	78	69	30	31	26	31	37	33	52	51	39	53	74	77	84	71	87	87	128	128	128	98	105	

[5] Data estimated.
[6] Undergraduate course started.
[7] Undergraduate course discontinued.
[8] Undergraduate course resumed.

TABLE 8.—Number of graduate students ...

No.	College
1	Alabama Polytechnic Institute
2	California, University of
3	Case School of Applied Science
4	Cornell University
5	Illinois, University of
6	Iowa State College of Agriculture and Mechanic Arts
7	Iowa, State University of
8	Kansas, University of
9	Maine, University of
10	Massachusetts Institute of Technology
11	[illegible]
12	Michigan State College of Agriculture and Applied Science
13	Michigan, University of
14	New York University
15	North Carolina State College of Agriculture and Engineering
16	Oklahoma Agricultural and Mechanical College
17	Pennsylvania State College
18	Purdue University
19	Rutgers University
20	South Carolina, University of
21	Texas, Agricultural and Mechanical College of
22	Texas, University of
23	Virginia Polytechnic Institute
24	Washington, University of
25	West Virginia University
26	Wisconsin, University of
1	Georgia School of Technology
2	Columbia University
3	Harvard University
4	Lehigh University
5	Pittsburgh, University of
	Total

[1] [illegible]
[2] Sanitary engineering course.
[3] Public health engineering course.
[4] Also, [illegible] were graduated in sanitary [illegible]

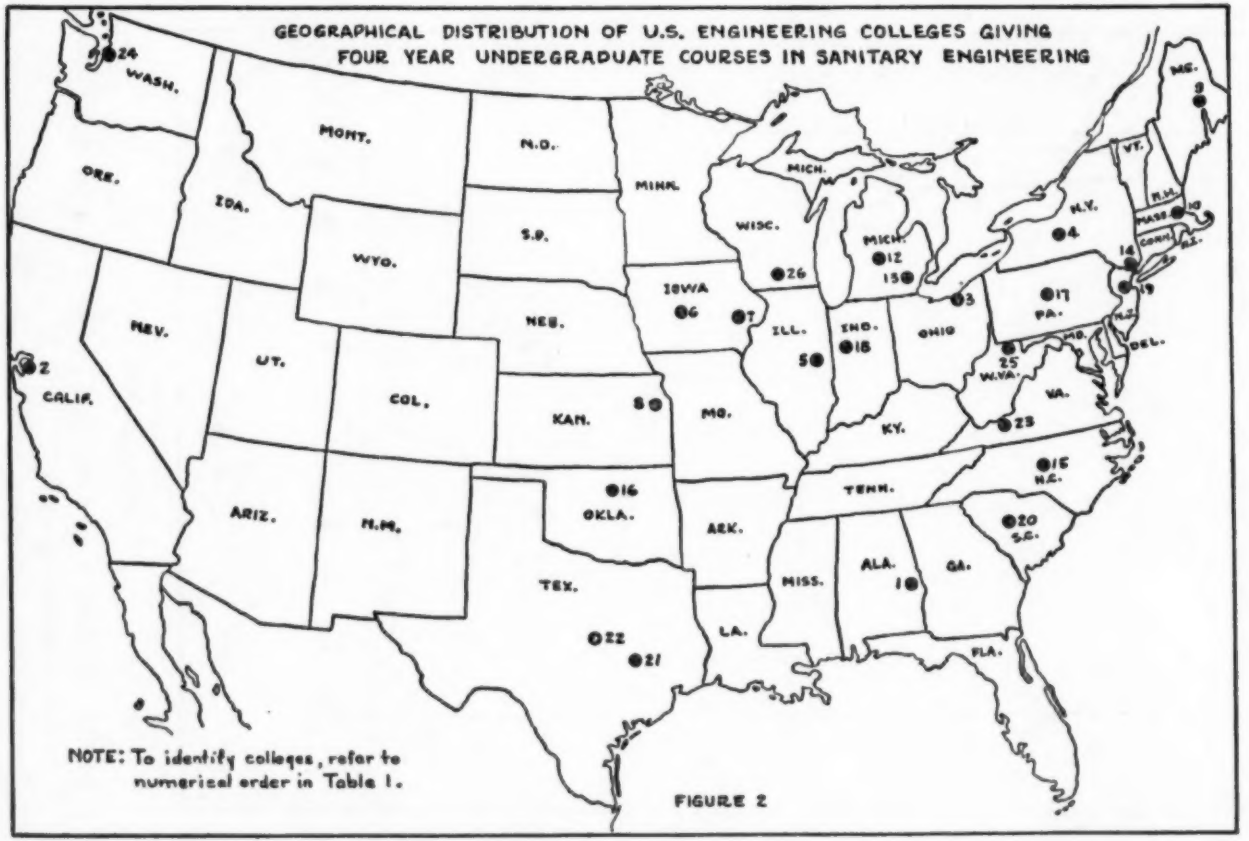
GEOGRAPHICAL DISTRIBUTION OF U.S. ENGINEERING COLLEGES GIVING FOUR YEAR UNDERGRADUATE COURSES IN SANITARY ENGINEERING
WASH.
ORE.
CALIF.
NEV.
IDA.
MONT.
WYO.
UT.
ARIZ.
COL.
N.M.
N.D.
S.D.
NEB.
KAN.
OKLA.
TEX.
MINN.
IOWA
MO.
ARK.
LA.
WISC.
ILL.
MICH.
IND.
OHIO
KY.
TENN.
MISS.
ALA.
GA.
FLA.
S.C.
N.C.
VA.
W.VA.
PA.
N.Y.
MD.
DEL.
N.J.
CONN.
R.I.
MASS.
VT.
N.H.
ME.
NOTE: To identify colleges, refer to numerical order in Table 1.

FIGURE 2

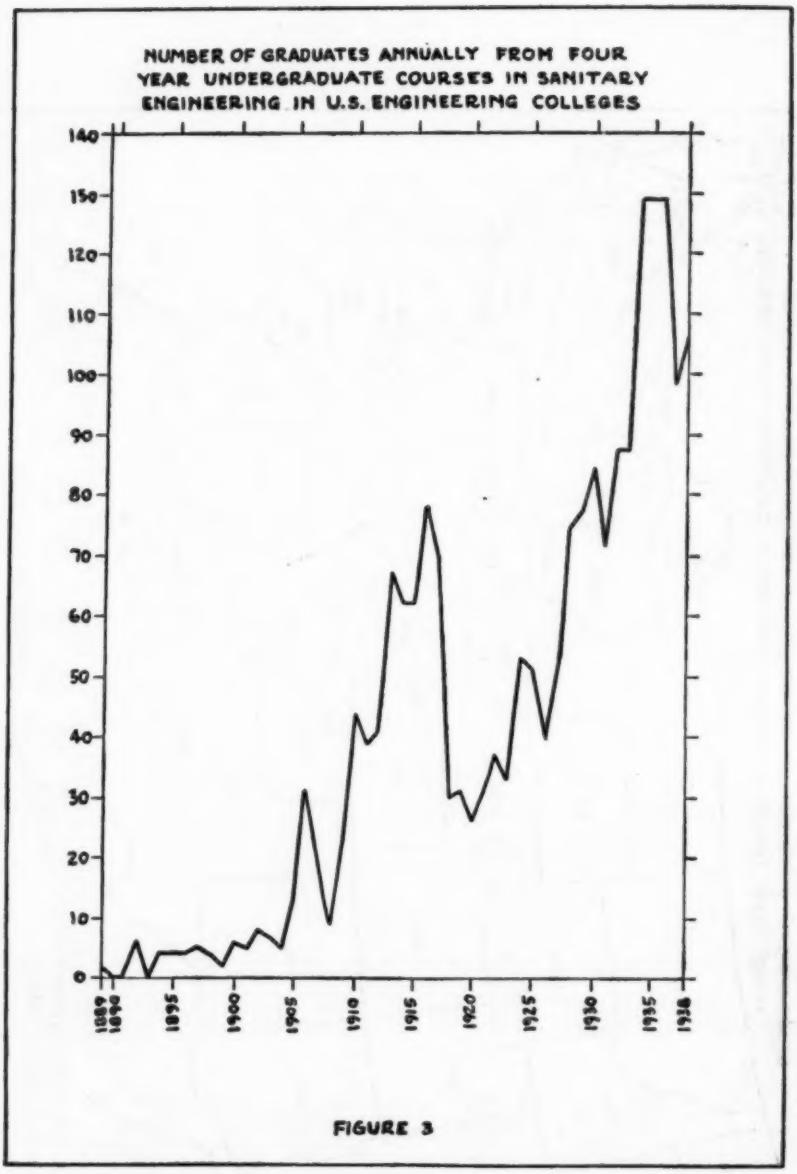

FIGURE 3

SUMMARY

1. In 1936–37 there were 25 colleges giving 26 courses in sanitary or public health engineering.

2. Three of these courses lead to degrees specifically naming sanitary or public health engineering.

3. The subjects contained within the courses were quite varied.

4. The number of graduates from these courses has increased very materially since 1916.

ACKNOWLEDGMENTS

The author would be ungrateful if he did not express his appreciation of the courtesy shown him by the authorities of the colleges with which he corresponded to secure these data. Thanks are due, also, to F. J. Maier, Assistant Public Health Engineer, United States Public Health Service, who tabulated and analyzed much of the material contained herein.

EVALUATION OF ODOR NUISANCE IN THE MANUFACTURE OF KRAFT PAPER

By J. M. DallaValle, *Passed Assistant Sanitary Engineer*, and H. C. Dudley *Associate Chemist, United States Public Health Service* [1]

Odor nuisances involve difficulties not often susceptible to simple methods of control. One of the chief reasons for the difficulties encountered is due to the low threshold values to which the nose is sensitive. Equally important is the fact that industrial processes giving rise to odor nuisances are so extensive as to require costly apparatus for removal of the sources of odor. No generalization of odor nuisance problems is possible without a complete knowledge of processes causing them, and each problem usually requires separate treatment. However, there are certain basic principles applying to the control of odor nuisances. This paper outlines a method used in evaluating the odor nuisance generated in the manufacture of heavy kraft paper by Na_2S–NaOH digestion process.

THRESHOLD LIMIT OF CERTAIN ODORS

The nose is very sensitive to minute traces of substances present in air. Organic substances, usually containing sulfur, appear to be most obnoxious to residents near plants producing them; but certain other gases, such as sulfur dioxide and chlorine, are frequently troublesome. In table 1 is given a list of threshold values of vapors and gases for which data are available. The concentrations shown in this table represent those which, when present in air, produce a noticeable odor. At lower concentrations the average person will note little or no odor. It will be seen that the values are remarkably low and indicate the difficulties which are inherent in attempts instituted for their control and quantitative estimation.

[1] Division of Industrial Hygiene, National Institute of Health.

TABLE 1.—*Concentrations and characteristics of various substances in air which are readily perceptible* [1]

Substance	Formula	Concentrations causing faint odor (mg/liter) (oz/1,000 cu. ft.)	Remarks
Acetaldehyde	$CH_3.CHO$	0.004	Pungent odor.
Acrolein	$CH_2:CH.CHO$	0.038	Acrid odor of burning fat.
"Akrol"	Mixed turpenes	0.01	Acrid pine-tar odor. Irritating.
Allyl alcohol	$CH_2:CH.CH_2OH$	0.017	Alcoholic odor. Not unpleasant.
Allyl amine	$CH_2:CH.CH_2.NH_2$	0.067	Odor similar to ammonia. Irritating.
Allyl disulfide	$(CH_2:CHCH_2)_2S_2$	0.0001	Garlic odor. Decomposes.
Allyl isocyanide	$CH_2:CH.CH_2.NC$	0.0043	Sweet but repulsive odor. Nauseating.
Allyl isothiocyanate	$CH_2:CH.CH_2.NCS$	0.0017	Mustard oil odor. Nose and eye irritant.
Allyl mercaptan	$CH_2:CH.CH_2.SH$	[2] 0.00005	Very disagreeable odor. Garlic.
Allyl sulfide	$(CH_2:CH.CH_2)_2S$	0.00005	Garlic odor.
Ammonia	NH_3	0.037	Sharp, pungent odor.
Amylene	C_5H_{10}	0.0066	Nauseating in high concentrations.
Amyl acetate (iso)	$CH_3COOC_5H_3(CH_3)_2$	0.0006	Banana odor.
Amyl isovalerate (iso)	$(CH_3)_2C_2H_2COOC_5H_3(CH_3)_2$	0.0008	Pleasant. Fruity.
Amyl mercaptan (iso)	$(CH_3)_2CH.CH_2.CH_2.SH$	0.0003	Unpleasant.
Amyl sulfide (iso)	$((CH_3)_2CHCH_2(CH_2)_2S$	0.0003	Strong and unpleasant odor.
Benzaldehyde	$C_6H_5.CH:O$	0.003	Odor of bitter almonds.
Benzyl chloride	$C_6H_5CH_2.Cl$	0.0016	Lacrimator. Aromatic.
Benzyl mercaptan	$C_6H_5CH_2.SH$	0.00019	Unpleasant odor.
Benzyl sulfide	$(C_6H_5CH_2)_2S$	0.0006	Unpleasant odor.
Bromacetone	$Br.CH_2.CO.CH_3$	0.0005	Pungent and stifling odor.
Bromacetophenone	$C_6H_5CO.CH_2.Br$	0.00064	Lacrimator. Odor like bromine.
Butylene (beta)	$CH_3.CH:CH.CH_3$	0.059	Gas-house odor.
Butylene (gamma)	$(CH_3)_2C:CH_2$	0.05	Gas-house odor.
n-Butyl mercaptan	$(CH_3)_2CH.CH_2.SH$	[2] 0.0014	Strong, unpleasant odor.
n-Butyl sulfide	$(C_4H_9)_2S$	0.0011	Unpleasant odor.
Carbon disulfide	CS_2	0.0026	Aromatic odor, slightly pungent.
Chloracetophenone	$C_6H_5.CO.CH_2Cl$	[2] 0.0085	Apple blossom odor. Strong lacrimator.
B-chlorvinyldichlorarsine	$Cl.CH:CH.AsCl_2$	0.014	Odor of geraniums. (Lewisite).
Chlorine	Cl_2	0.010	Pungent and irritating odor.
Chlorophenol	$Cl.C_6H_4.OH$	0.00018	Medicinal odor. Phenolic.
Chlorpicrin	Cl_3CNO_2	0.0073	Fly paper odor.
Coumarine	$C_6H_4CH:CH.CO.O$	0.00034	Vanilla odor. Pleasant.
Crotonaldehyde	$CH_3.CH:CH.CH.O$	[2] 0.021	Eye and nose irritant.
Crotyl mercaptan	$CH_3.CH:CH.CH_2.SH$	0.000029	Skunk odor.
Cyanogen chloride	$CNCl$	0.0025	Bitter almonds.
Dichlordiethyl sulfide	$(ClC_2H_4)_2S$	0.0013	Garlic or horseradish odor (mustard gas).
Dichlorethylene (trans)	$C_2H_2Cl_2$	0.0043	Ethereal odor.
Dimethyl trithiocarbonate.	$CH_3S.CS.SCH_3$	0.00018	Foul and disagreeable.
Diphenylamine chlorarsine.	$(C_6H_4)_2NHAsCl$	0.0025	Slight odor.
Diphenyl chlorarsine	$(C_6H_5)_2AsCl$	0.0003	Shoe polish odor.
Diphenyl cyanarsine	$(C_6H_5)_2AsCN$	0.0003	Odor of bitter almonds and garlic.
Diphenyl ether	$(C_6H_5)_2O$	0.000069	Geranium odor. Pleasant.
Diphenyl sulfide	$(C_6H_5)_2S$	0.000048	Ethereal, but unpleasant odor.
Diphosgene	$ClCO_2-CCl_3$	0.0088	Suffocating, disagreeable odor.
Dithio-ethylene glycol	$CH_2SH.CH_2SH$	0.0016	Disagreeable, garlic-like odor.
Ethylene dichloride	$C_2H_4Cl_2$	0.025	Aromatic. Ethereal.
Ethyl dichlorarsine	$C_2H_5AsCl_2$	0.001	Irritating, biting.
Ethyl isothiocyanate	$CH_3CH_2N:C:S$	0.038	Mustard oil. Irritating odor.
Ethyl mercaptan	$CH_3CH_2.SH$	[2] 0.00019	Odor of decayed cabbage.
Ethyl selenide	$CH_3CH_2.Se.CH_3CH_3$	0.000062	Garlic odor. Putrid and nauseating.
Ethyl seleno mercaptan	$CH_3CH_2.Se.H$	0.0000018	Very foul and disagreeable odor.
Ethyl sulfide	$(C_2H_5)_2S$	0.00025	Garlic-like, foul odor. Nauseating.
Hydrogen cyanide	HCN	0.001	Odor of bitter almonds.
Hydrogen sulfide	H_2S	0.0011	Odor of rotten eggs. Nauseating.
Methyl anthranilate	$NH_2.C_6H_4.CO.OCH_3$	0.00037	Floral essence. Fruity odor.
Methyl dichlorarsine	CH_3AsCl_2	0.0008	Slight odor. Irritating.
Methyl mercaptan	CH_3SH	0.0011	Odor of decayed cabbage or onions.

[1] Based on data from references (*1*) and (*2*).
[2] Average value of observations obtained with material of varying purity.

TABLE 1.—*Concentrations and characteristics of various substances in air which are readily perceptible*—Continued

Substance	Formula	Concentrations causing faint odor (mg/liter) (oz/1,000 cu. ft.)	Remarks
Methyl sulfide	$(CH_3)_2S$	0.0011	Odor of decayed vegetables.
Methyl thiocyanate	$CH_3S.CN$	0.0096	Odor of almonds. Unpleasant.
Nitrobenzene	$C_6H_5.NO_2$	0.03	Odor of bitter almonds.
Oxidized oils		0.0011	Unpleasant and irritating.
Ozone	O_3	0.001	Slightly pungent, irritating odor.
Phenyl isocyanide	$C_6H_5.N:C$	[1]0.000029	Repulsive, nauseating odor.
Phenyl isothiocyanate	$C_6H_5.N:C:S$	0.0024	Cinnamon odor. Pleasant.
Phosgene	$COCl_2$	0.0044	Odor of ensilage or fresh-cut hay.
Propioaldehyde	$CH:CCHO$	0.0022	Acrid, irritating odor.
Propyl mercaptan	C_3H_7SH	0.000075	Unpleasant odor.
n-Propyl sulfide	$(CH_3CH_2CH_2)_2S$	0.00081	Foul odor. Nauseating.
Pyridine	C_5H_5N	[1]0.0037	Disagreeable, irritating odor.
Skatole	C_9H_9N	0.0012	Fecal odor. Nauseating.
Sulfur dioxide	SO_2	0.009	Pungent, irritating odor.
Thiocresol	$CH_3.C_6H_4.SH$	0.0001	Rancid, skunk-like odor.
Thiophenol	C_6H_5SH	0.000062	Putrid, nauseating odor.
Trinitro butyl xylene	$(CH_3)_2.C_6(NO_2)_3.C(CH_3)_3$	0.00001	Musk odor.

[1] Average value of observations obtained with material of varying purity.

MANUFACTURE OF KRAFT PAPER

Kraft paper is that type of brown paper commonly used in retail stores for the wrapping of packages. Heavier grades of this type of paper are used in the production of cardboard and heavy paper shipping containers and cartons. In the plant at which this study was made, a heavy grade kraft paper was manufactured and shipped elsewhere for the fabrication of shipping cartons.

To understand the origin of odors generated in the manufacture of kraft paper, it is necessary to outline the process used. Kraft plants must be considered with reference to two processes, namely, first, the preparation of logs and their digestion, and, second, the recovery and processing of chemicals used. The odor-producing substances when exhausted or blown into the atmosphere cover a wide area and are a source of complaint.

The sodium sulfide and similar digestion processes are used extensively in the recently developed slash pine paper industry of the Southern States for the production of kraft and other papers.

Four-foot pine logs are first debarked and then cut into chips. The undried chips are placed in large digesters where they are cooked with live steam (under pressure of 125 pounds per square inch) for 2 to 3 hours. The digester liquor contains sodium hydroxide (NaOH) and sodium sulfide (Na_2S). This treatment causes a disintegration of the wood into individual fibers and subsequent solution of all resins, volatile oils, and pine tar. As the digestion continues, steam is led into the bottom of the large vats and is exhausted near the top. This exhaust steam from the digesters is condensed and large quantities of

crude sulfonated turpentine and other mixed essential oils are partially recovered. After the digestion is complete, the contents of the vat are transferred to special tanks and the digestion liquor is drawn off. The pulp is now washed, screened, and passed either to storage bins or to the paper mill where, after further treatment to insure the complete disintegration of all fibers, the pulp is passed through rolls and the finished product produced.

It will be noted from the preceding discussion that, after digestion of the chips, the digestion liquor is drawn off the cooked pulp. In order to make this process commercially economical, the sodium sulfate, sodium hydroxide, and sodium sulfide remaining in this solution must be recovered and reused. This black liquor is now passed into vacuum evaporators where sufficient water is removed so that the content of total solids is 45 to 50 percent. This heavy, viscous liquid is led into drying furnaces where it is dried by hot gases from the smelters. As the hot liquor passes forward through the furnaces it loses moisture, so that on reaching the smelters it is completely dry and is in a molten state. At this point (in the smelter) high pressure air jets are directed into this mass of material, causing the rapid oxidation of the resins, pitch, and other organic constituents. As this oxidation takes place, NaOH is converted to Na_2CO_3 and all Na_2S_4 to Na_2S. The hot gases which result from this oxidation are led over the incoming partially dried digester liquor, through refuse heat boilers (producing steam for turbines), and thence to the stacks. The contents of the gases which go into the stacks are discussed in detail later, as they constitute the major source of unpleasant odors produced by the plant.

The molten sludge (largely Na_2CO_3 and Na_2S) is dropped into cold water or dilute digester liquor, is filtered, and then treated with quicklime (CaO). It is this hot liquor containing Na_2S and Na_2CO_3 which gives off some hydrogen sulfide (H_2S) gas. After treatment with CaO, the $CaCO_3$ formed is settled out in Dorr separators. The caustic liquid (containing NaOH and Na_2S) is pumped to the digesters and reused. The precipitated $CaCO_3$ is burned with the bark removed from the logs, thus re-forming CaO.

SOURCES OF NUISANCE ODORS

There are three types of obnoxious odors due to processes being carried on in this plant, namely, (1) hydrogen sulfide, (2) volatile organic sulfur compounds, and (3) chemical smoke containing sodium sulfate, sodium sulfide, traces of H_2S, and quantities of carbon and organic materials. The sources and origin of each of these three types of odors are as follows:

Hydrogen sulfide is formed and released to the atmosphere (1) at smelter furnaces where molten Na_2CO_3 and Na_2S are dropped into water, and (2) in separator building where this solution is filtered.

The treatment of the fresh wood chips by the digester liquor containing Na_2S brings about the formation of many unknown volatile organic sulfur compounds. At nearly all points of the process at which the pulp is handled after the digestion, certain of these ill-smelling volatile organic compounds are liberated. The greatest volume and concentration of these compounds are released (1) from the turpentine condenser as steam is led from the digester tanks, and (2) when the pulp is blown from the digesters with the release of large quantities of steam containing many volatile constituents.

The large quantities of smoke which are released through exhaust stacks are generated as the result of the rapid oxidation in the smelters of the resins, pitch, and organic materials present in the evaporated digester liquors. The high pressure air jets which cause this oxidation also cause the atomization of the molten sludge. This process releases large amounts of Na_2SO_4 in colloidal state; this finely divided material is carried by the wet gases through the waste heat boiler and out the exhaust stacks. Although Na_2SO_4 in a pure state is odorless, there accompany these particles much uncarbonized organic matter, traces of H_2S, and various volatile oils of unknown composition. These organic materials, which are at least partially adsorbed on the colloidal particles of Na_2SO_4, give rise to the peculiar odor noted when this smoke is blown across the ground.

METHODS AND RESULTS

In the determination of the concentration of hydrogen sulfide (H_2S), a standard M. S. A. hydrogen sulfide detector was used. No estimation can be made as to the absolute quantity of H_2S which is released, since the gas is formed when molten Na_2S is dropped into cold water. Varying amounts of the H_2S are formed with large quantities of steam.

The concentration of H_2S at the points of origin is usually less than 0.001 percent by volume as measured by the M. S. A. H_2S detector. As a source of obnoxious odors contributing to the conditions outside the plant area, the formation of H_2S at those points may be disregarded. Even over the vats, where the H_2S is of greatest concentration, the odor is but little above the threshold value.

In collecting the material which causes the marked and ill-smelling odor at and near the turpentine condenser, it was necessary to freeze out the volatile constituents of the gases issuing from the turpentine condenser vents. The vapors which issue from this vent are composed largely of steam, with small amounts of volatile organic sulfur

compounds. The gases were drawn from the vent stack through a calcium chloride tube, thence through a condenser tube which was cooled by CO_2 snow at a rate of seven liters per minute. As the vapors passed through the $CaCl_2$ tube a greater part of the water vapor was removed; there remained, however, sufficient H_2O vapor in the air stream to produce much frost inside the cooled condenser tube. No worthwhile estimation can be made as to the quantity of volatile organic materials which are released at the condenser vent or at the point of release of vapors from the digester blow-off. These vapors, largely steam, are blown off intermittently and it is doubtful whether any estimate of the total volume would be possible. Likewise, at each stage of the process, including the paper making, there are released moderate quantities of these volatile materials.

In order to obtain samples of the stack gases, a one-liter wide-mouth bottle was fitted with a two-hole rubber stopper. In this stopper were attached glass tubes. By attaching one of the tubes to a water suction pump and drawing the stack gases through this bottle, flushing out all residual air, a sample of the stack gases was obtained. Qualitative tests show that the stack gases contain small amounts of free H_2S and are slightly acid in reaction. The air-dried solid material from the stacks when dissolved in distilled water gave a neutral reaction (to litmus).

The solids of the stack gases for chemical analysis were sampled as follows: A special gas-sampling tube filled with absorbent cotton was introduced into the bottom of the stack, and the gases were drawn through this tube by means of a water suction pump. The solid material which was collected in this manner was analyzed for the more important contituents on returning to the laboratory.

Analysis of the air-dried solid material which passes into stacks under normal operating conditions shows the following constituents:

	Percent
Moisture	7. 8
Na_2SO_4	75. 1
Na_2S	Trace
Water soluble organic matter	9. 8
Ether soluble organic matter	1. 8
Free carbon	5. 5

It is estimated that at a normal production rate of 300 tons of finished paper per 24 hours there will be lost through the exhaust stack of the smelter a total quantity of 18,000 pounds of Na_2SO_4 per 24-hour day.

The concentration of total solids of the stack gases as they issue from the stacks may be estimated, since the total rate of induced draft of the stack has been given as 88,000 cubic feet per minute. Therefore, the estimate of total solids in the gases as they pass from the stack is 0.003 ounces per cubic foot (3 mg/l.).

In addition to the solids previously mentioned, there is a great amount of moisture, some traces of H_2S, and rather large quantities of volatile organic matter. Since by an analysis of the solids contained in the stack gases it has been shown that 75 percent of the solid constituents of these gases is Na_2SO_4, it is estimated that about 12 tons of solid material per 24 hours will pass from the exhaust stacks.

It is the volatile organic matter not shown by the above analysis, the volatile organic matter that is adsorbed on the particles of Na_2SO_4, and the solid organic constituents of the stack gases which largely produce the odor of this smoke. It must be remembered that only very minute amounts of materials are required to produce marked odors, as, for instance, but one to two parts per million of ethyl mercaptan produces a marked and unpleasant odor (concentration 0.005 mg/l.).

DISCUSSION

Concentration of H_2S at the points of origin is less than 0.001 percent by volume as measured by M. S. A. H_2S detector. As a source of obnoxious odors contributing to the conditions outside the plant area, the formation of H_2S at those points may be disregarded. Even over the vats where the H_2S is of greatest concentration, the odor is but little above the threshold value.

Although the odor of the mixture of the various volatile organic sulfur compounds as released in normal operation is very ill smelling (like rotten cabbage), it seems from our observations that this odor is not the major factor in producing the unpleasant conditions in areas away from the plant. However, by controlling the release of these organic vapors where possible and at those points where greater quantities are released, there will undoubtedly be a lessening of the obnoxious conditions. It seems probable that the major sources of this odor might be controlled by causing the vapors from the turpentine condensers and the exhaust steam from the digester blowoffs to be led into a tall stack, or preferably under a boiler (thereby being burned).

Heretofore many individuals have been misled by statements that the odors of this type of plant were due to mercaptans. This misunderstanding may be caused by some persons classing all organic sulfur compounds as mercaptans. Work done in this laboratory has shown that the crude turpentine which is steam distilled from the digesters contains 1 to 3 percent dimethyl sulfide, small amounts of ethyl mercaptan, and many other unknown sulfur compounds. The markedly unpleasant odor which is noted at many points in the plant area is due to steam distillation and subsequent release of these volatile organic sulfur compounds.

RECOMMENDATIONS

The following steps are suggested as a working basis in the study of methods for control and removal of sources of odors in kraft as well as other pulp and paper mills. Modifications of these procedures may well be applied to the study of control of odors generated at many industrial establishments.

1. Insofar as practical, all vapors and gases from the turpentine condenser should be passed into stacks or, preferably, passed under boiler fires so that they will be completely oxidized.

2. The turpentine condenser should be housed in a building having forced draft ventilation such that the vapors will be combined with the vapors of the condenser vents (disposal suggested in preceding recommendation).

3. The steam and vapors arising from the pulp digesters, when pulp is transferred to settling tanks, should be trapped and condensed, and the condensate handled in the same manner as are the vapors from the turpentine condenser and vents.

4. A survey should be made of the air currents prevailing at a height of 200 to 500 feet, with an estimation of the influence of these currents, as well as the influence of topography of the surrounding countryside. The above factors should be studied before beginning the construction of any high stack, as the high density of chemical smoke will make adequate dispersion difficult.

5. A critical study should be made of the possibility of the use of a large electrical precipitator designed so that continuous operation of the plant will be possible; this precipitator should be designed so that electrodes and fittings will withstand the corrosive action of wet gases containing large amounts of inorganic and organic sulfur compounds. Units of this type have been used in similar plants (*3*, *4*) and may well effect a major economy of operation, since large amounts of Na_2SO_4 would be recovered and again passed through the smelter to form NaOH and Na_2S.

SUMMARY

This report deals with the results of a study made on the obnoxious odors generated in the manufacture of kraft paper. There are three sources of obnoxious odors due to processes being carried on in the plant studied, caused by (1) production of H_2S, (2) production of volatile organic sulfur compounds, and (3) release of large quantities of chemical smoke which contains sodium sulfate, sodium sulfide, traces of H_2S, and large quantities of carbon and organic materials.

In evaluating the sources of odors and their contribution to the general disagreeable conditions which arise downwind from the plant due to these odors, it may be stated that (1) the amount of H_2S which is released from the plant is relatively small and may be considered of no consequence in causing any odor except at the point of origin in certain buildings; (2) the odor produced by the release of organic sulfur vapors from the pulp digesters and the vapors from the turpentine condensers is very disagreeable at the point of release; however, the quantity of such vapors is probably not sufficient to cause marked odors under normal operating conditions at any great distance from the plant; and (3) the greatest and, it seems probable, the only major contributing factor to the obnoxious conditions arising from the operations of this plant within a mile or more is due to the vast quantities of materials which are blown out of the stacks. In a plant manufacturing 300 tons per day of kraft paper, this smoke is estimated to contain, under normal operating conditions, 18,000 pounds of sodium sulfate per 24-hour day. In addition to this quantity of material, there is much carbon, partially carbonized organic matter, as well as a mixture of somewhat volatile oils. This smoke is of rather low temperature and soon reaches the ground, being spread over an area of several square miles. The peculiar sweetish and somewhat sickening odor seems to be due to the organic constituents.

Methods of study are recommended which may lead to the control of the odor-generating processes. The possibilities of electrical precipitators to prevent an excess of chemical smoke are stressed.

ACKNOWLEDGMENTS

Acknowledgment is here made of the assistance rendered by the Division of Industrial Hygiene of the South Carolina State Department of Health, and particularly to Dr. Harry F. Wilson, director, and Mr. Robert M. Brown, chemical engineer.

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AMBLYOMMA PHILIPI—A NEW TICK FROM TEXAS AND MEXICO, WITH A KEY TO KNOWN SPECIES OF *AMBLYOMMA* IN THE UNITED STATES[1]

(ACARINA: Ixodidae)

By R. A. Cooley, *Entomologist*, and Glen M. Kohls, *Assistant Entomologist*, *Rocky Mountain Laboratory, United States Public Health Service*

Amblyomma philipi n. sp.

An inornate species with the sexes showing a marked disparity in size.

FEMALE

DORSAL VIEW

Capitulum.—Greatest width of basis (holotype) 0.66 mm. The width of the basis in each of the three paratype specimens is 0.60 mm. Color yellow-brown excepting the postero-lateral areas, which are darker. Basis trapezoidal with the posterior margin straight or a little curved. Surface shining, punctate in the area near the posterior border and in the median area posterior to the insertion of the chelicerae. Porose areas oval, depressed, with the long axes divergent anteriorly.

Palpi.—Long; article 2, 0.48 mm; article 3, 0.21 mm (holotype); a few short hairs are present.

Scutum.—Length 1.62 mm; width 1.50 mm (holotype). Length of smallest female paratype 1.38 mm; width 1.38 mm. Length of largest female paratype 1.50 mm; width 1.44 mm. Yellow-brown excepting in the lateral areas back of the eyes, which are darker. Broadly rounded posteriorly. Surface shining, punctate throughout excepting in the two lateral mildly elevated areas a little behind the eyes. Punctations smaller in the anterior areas. Cervical grooves distinct, moderately deep anteriorly, and terminating before reaching the postero-lateral margins. Eyes nearly flat.

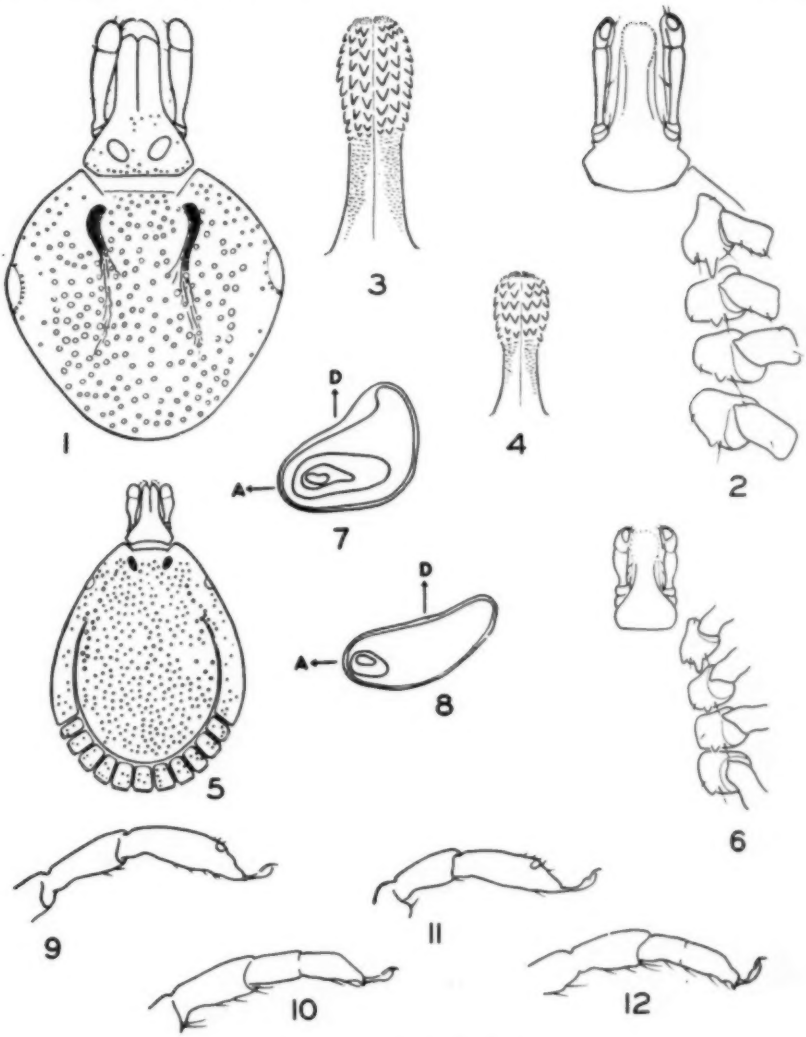
Post-scutal area.—Marginal groove moderate in depth, complete and limiting all festoons. A few scattered, short hairs are present.

Legs.—Length of tarsus I, 0.55 mm; metatarsus I, 0.39 mm. Length of tarsus IV, 0.48 mm; metatarsus IV, 0.42 mm; tarsus I heavier than the other tarsi. A short terminal ventral spur is present on tarsus IV. Moderately long, fine hairs are present on all the legs.

VENTRAL VIEW

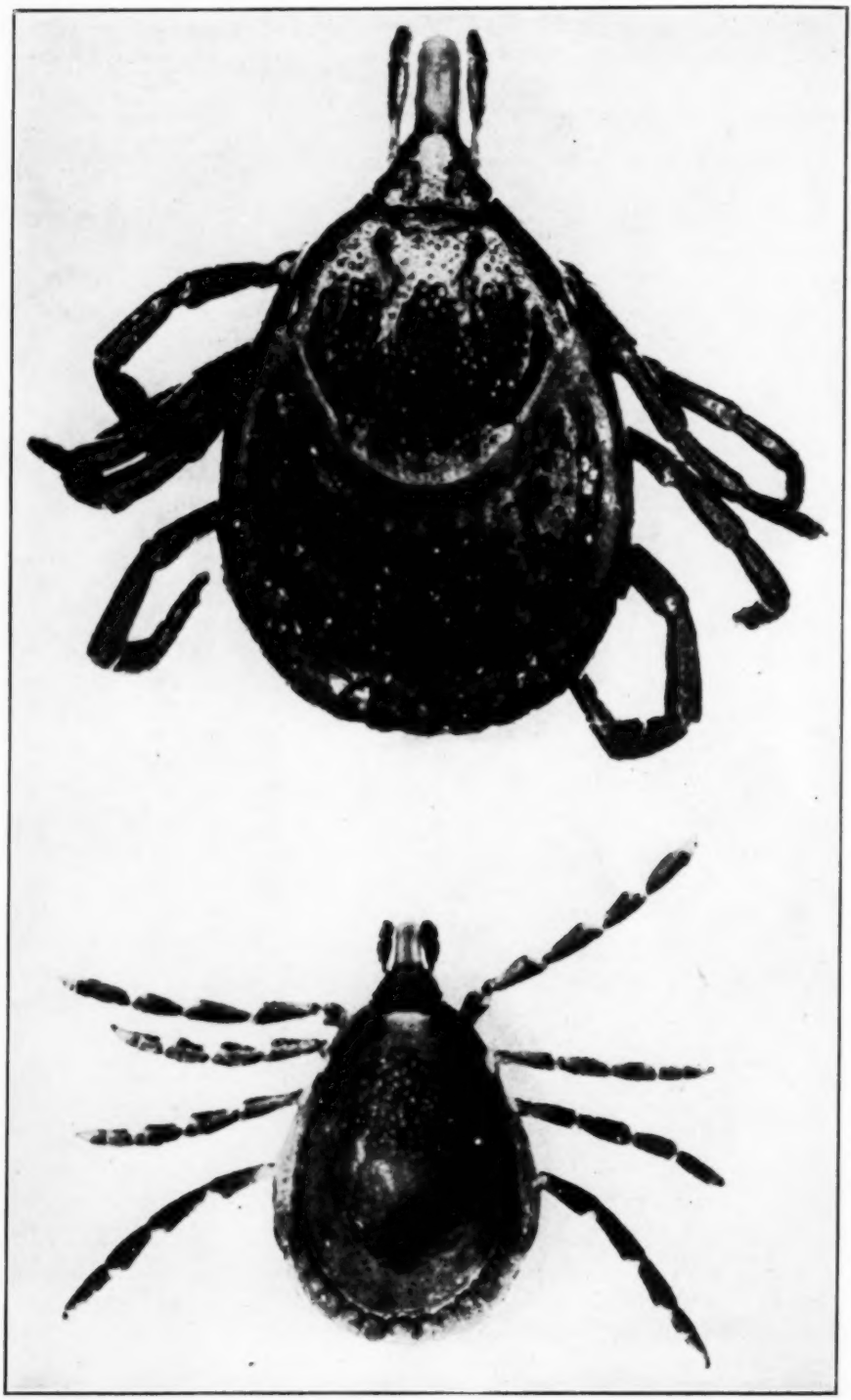
Capitulum.—Basis shining, impunctate and without hairs; posterior margin a curved, salient edge. Hypostome long, with the teeth in three files on each side of the median line and limited to the terminal

[1] Contribution from the Division of Infectious Diseases, National Institute of Health, Rocky Mountain Laboratory, Hamilton, Montana.



AMBLYOMMA PHILIPI N. SP.

1. Capitulum and scutum, female.
2. Capitulum and coxae (ventral), female.
3. Hypostome, female.
4. Hypostome, male.
5. Dorsal view, male.
6. Capitulum and coxae (ventral), male.
7. Spiracular plate, female.
8. Spiracular plate, male.
9. Metatarsus and tarsus, leg I, female.
10. Metatarsus and tarsus, leg IV, female.
11. Metatarsus and tarsus, leg I, male.
12. Metatarsus and tarsus, leg IV, male.



AMBLYOMMA PHILIPI N. SP.

Female above, very slightly engorged. Male below. The figures are equally magnified.

two-fifths of the length. When mounted in balsam, the hypostome shows, under a microscope, numerous abortive teeth in the more basal portion.

Coxae.—The coxae are small and variable in shape. Coxa I with the longer, external spur moderately long, and the internal one, short. Coxae II, III, and IV each with a short external spur (about as long as the internal spur on coxa I). All the coxae bear a few fine hairs which are longer than those on the legs. Sexual opening located at the level of coxae III.

Spiracular plate.—Macula spot much elongated. Dorsal horn broad and moderately long. Goblets very numerous.

MALE

Color yellow-brown throughout excepting the lateral areas of the basis, which are darker. Length of allotype (capitulum excluded), 1.89 mm; width, 1.44 mm. Length of smallest male paratype 1.71 mm, width 1.26 mm. Length of largest male paratype 2.10 mm, width 1.44 mm.

DORSAL VIEW

Capitulum.—Width of basis (allotype), 0.39 mm. Trapezoidal in shape and with the posterior edge curved forming definite postero-lateral angles. Surface shining, punctate.

Palpi.—Relatively shorter and broader than in the female; broadly rounded apically. Article 2 about twice as long as article 3. Length of articles 2 and 3, 0.33 mm (allotype). A very few fine short hairs are present on the palpi.

Scutum.—Shining and punctate. Punctations a little larger in restricted lateral areas back of the eyes. Cervical grooves deep, short and mildly divergent anteriorly. Lateral grooves distinct and complete (reaching forward to the margin of the pseudo-scutal area). Festoons separated by straight lines. Festoons with fine, sparse punctations. The lateral areas outside of the lateral grooves, anterior to the festoons, also have fine punctations.

Legs.—Length of tarsus I, 0.48 mm; metatarsus I, 0.30 mm; length of tarsus IV, 0.45 mm; metatarsus IV, 0.36 mm. Tarsus I is heavier than the other tarsi. A short terminal ventral spur is present on tarsus IV. All legs have hairs as in the female.

VENTRAL SURFACE

Coxae.—Essentially as in the female.

Sexual opening located at the level of coxae II.

Spiracular plate.—Sub-oval in shape and without a definite dorsal horn. Macula spot small, oval and placed near the antero-ventral end. Goblets very numerous.

Holotype (female), A. P. 14069, "rabbit," Kingsville, Tex., June 10, 1938, J. C. Brown, coll.; *allotype* (male) A. P. 14332, coyote (*Canis* sp.), Kingsville, Tex., May 25, 1938, C. B. Philip, coll., both deposited in the collection of the Rocky Mountain Laboratory, Hamilton, Mont.

Paratypes, 3 females and 9 males as follows: A. P. 14190; cottontail (*Sylvilagus* sp.), Kingsville, Tex., March 24, 1938, 1 male, J. C. Brown, coll.; A. P. 14295, jack rabbit (*Lepus* sp.), Kingsville, Tex., May 24, 1938, 1 male, C. B. Philip, coll; A. P. 14329–30–31, 3 coyotes (*Canis* sp.), Kingsville, Tex., May 25, 1938, 3 males, 1 female, C. B. Philip, coll.; A. P. 15139, host unknown, Rancho La Golondrina, Rio Sabinas, Muzquiz, Coahuila, Mexico, June 28, 1938, 4 males, 2 females, Rollin H. Baker, coll.

Paratype male and female have been deposited in the United States National Museum.

This inornate species is readily distinguishable from the five species of *Amblyomma* previously known in the United States, *A. americanum* (Linnaeus 1758), *A. cajennense* (Fabricius 1789), *A. dissimile* Koch 1844, *A. maculatum* Koch 1844, and *A. tuberculatum* Marx 1893–1894, all of which are ornamented.

In Robinson (1926) this species runs to *parvum* Aragao 1908, from which it may be distinguished as follows: In *philipi* the palpi are longer, more slender, and lack the ventral retrograde spur on article 1; and in the female *philipi* the length of articles 2 and 3 combined is 0.69 mm, in *parvum*, 0.57 mm.

This species apparently also resembles *A. curruca* Schulze 1936, a small, inornate tick from Venezuela. In the Schulze description no detailed drawings are given, but from the photographs as well as the descriptions it is evident that the males of *philipi* differ in having the festoons separated by straight lines and in lacking the ventral retrograde spur on palpal article 1. The separation of the females appears to be more difficult; but Schulze emphasizes the two tones in the coloring of the scutum, while in *philipi* this feature is not at all striking. The female genital aperture in *curruca* is stated to be between coxae II, while in *philipi* it is between coxae III.

This species is named for our associate, Dr. Cornelius B. Philip, medical entomologist, of the Rocky Mountain Laboratory.

Key to the Known Species of *Amblyomma* in the United States

FEMALES

1. Inornate ticks ..... *philipi* n. sp.
   Ornate ticks 2

2. Coxa I with the external spur distinctly longer than the internal spur. 3
   Coxa I with subequal spurs 5

FEMALES—continued

3. Scutum with the pale markings in an extensive pattern 4
   Scutum with the pale markings in a principal spot near the posterior end ..... *americanum*

4. Coxa I with the internal spur about half the length of the external spur ..... *cajennense*
   Coxa I with the internal spur very short or insignificant ..... *maculatum*

5. Coxa IV with the external spur longer than the internal spur ..... *dissimile*
   Coxa IV with the two spurs about equal ..... *tuberculatum*

MALES

1. Inornate ticks ..... *philipi* n. sp.
   Ornate ticks 2

2. Coxa I with the internal spur moderately long 3
   Coxa I with the internal spur either short or insignificant 4

3. Scutum with the pale markings in an extensive, connected pattern ..... *cajennense*
   Scutum with the few pale markings in isolated spots only ..... *americanum*

4. Coxae II, III and IV each with one spur only ..... *maculatum*
   Coxae II, III and IV each with two spurs 5

5. Coxa IV with external spur distinctly longer than internal spur ..... *dissimile*
   Coxa IV with both spurs short ..... *tuberculatum*

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DEATHS DURING WEEK ENDED DECEMBER 24, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Dec. 24, 1938	Corresponding week, 1937
Data from 88 large cities of the United States:		
Total deaths	8,552	[1] 8,632
Average for 3 prior years	[1] 8,966	
Total deaths, first 51 weeks of year	415,015	440,022
Deaths under 1 year of age	491	[1] 509
Average for 3 prior years	[1] 538	
Deaths under 1 year of age, first 51 weeks of year	26,669	28,149
Data from industrial insurance companies:		
Policies in force	68,268,314	69,971,632
Number of death claims	13,049	12,424
Death claims per 1,000 policies in force, annual rate	10.0	9.3
Death claims per 1,000 policies, first 51 weeks of year, annual rate	9.2	9.7

[1] Data for 86 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables, a zero (0) indicates a positive report and has the same significance as any other figure, while leaders (----) represent no report, with the implication that cases or deaths may have occurred but were not reported to the State health officer.

Cases of certain diseases reported by telegraph by State health officers for the week ended December 31, 1938, rates per 100,000 population (annual basis), and comparison with corresponding week of 1937 and 5-year median

Division and State	Diphtheria				Influenza				Measles			
	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median
NEW ENG.												
Maine	61	10	4	0	24	4	6	2	30	5	35	21
New Hampshire	10	1	0	0	----	----	----	----	----	----	103	25
Vermont	0	0	0	0	----	----	----	----	163	12	179	40
Massachusetts	7	6	3	15	----	----	----	----	212	180	96	122
Rhode Island	0	0	0	1	----	----	----	----	----	----	----	6
Connecticut	21	7	6	1	18	6	6	6	150	50	9	48
MID. ATL.												
New York	14	36	42	39	[1] 8	[1] 12	[1] 17	[1] 19	260	645	189	378
New Jersey	22	18	20	20	23	19	20	18	24	20	675	119
Pennsylvania [2]	13	25	39	39	----	----	----	----	22	42	3,330	509
E. NO. CEN.												
Ohio	43	55	60	60	----	----	35	35	12	16	448	156
Indiana	27	18	26	36	18	12	35	50	12	8	88	88
Illinois	32	49	36	52	13	20	29	35	15	22	1,299	53
Michigan [3]	18	17	23	16	1	1	3	3	173	160	647	29
Wisconsin	5	3	7	6	78	44	29	30	547	307	223	168
W. NO. CEN.												
Minnesota	18	9	1	5	[2]	4	----	----	1,064	541	7	14
Iowa	16	8	5	7	14	7	7	3	335	164	15	15
Missouri	18	14	50	37	38	29	67	67	4	3	1,644	158
North Dakota	22	3	2	2	89	12	----	----	997	135	1	1
South Dakota	15	2	1	1	53	7	1	1	1,959	260	----	2
Nebraska	8	2	0	2	8	2	----	----	11	3	4	8
Kansas	22	8	8	9	11	4	4	1	8	3	53	24
SO. ATL.												
Delaware	0	0	0	3	----	----	----	----	----	----	2	13
Maryland [3]	12	4	6	8	37	12	22	22	450	145	11	39
Dist. of Col.	8	1	5	5	58	7	4	1	8	1	8	5
Virginia	85	44	34	34	337	175	----	----	17	9	163	109

Cases of certain diseases reported by telegraph by State health officers for the week ended December 31, 1938, rates per 100,000 population (annual basis), and comparison with corresponding week of 1937 and 5-year median—Continued

Division and State	Diphtheria				Influenza				Measles			
	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median
SO. ATL.—continued												
West Virginia	50	18	12	24	36	13	22	47	89	32	43	20
North Carolina [2 4]	57	38	35	34	6	4	18	18	457	306	558	503
South Carolina [2]	17	6	3	5	965	347	311	288	8	3	249	15
Georgia [2]	15	9	10	18	210	124	----	86	161	95	----	----
Florida [2]	28	9	30	10	9	3	2	2	41	13	23	7
E. SO. CEN.												
Kentucky	29	16	6	20	68	38	22	15	12	7	127	23
Tennessee	18	10	25	26	76	42	120	63	31	17	251	21
Alabama [2]	34	19	17	26	258	143	371	110	76	42	41	41
Mississippi [2 3]	28	11	22	8	----	----	----	----	----	----	----	----
W. SO. CEN.												
Arkansas	38	15	22	15	517	203	192	36	112	44	64	18
Louisiana [2]	32	13	8	19	24	10	47	7	71	29	----	2
Oklahoma	31	15	15	15	252	123	114	111	18	9	----	4
Texas [2]	30	35	45	67	325	385	444	324	72	85	23	32
MOUNTAIN												
Montana	0	0	0	2	145	15	----	7	2,718	281	2	3
Idaho	32	3	0	0	53	5	5	----	264	25	6	6
Wyoming	22	1	0	0	----	----	----	----	399	18	----	1
Colorado	39	8	6	6	200	41	----	----	107	22	96	9
New Mexico	25	2	8	3	49	4	5	3	111	9	61	31
Arizona	25	2	2	2	1,519	120	90	51	25	2	2	4
Utah [2]	10	1	4	0	80	8	----	----	161	16	57	16
PACIFIC												
Washington	9	3	7	3	----	----	----	----	437	139	4	69
Oregon	5	1	1	1	203	40	21	36	107	21	15	15
California [2]	33	39	40	40	22	26	38	40	707	835	48	66
Total	25	614	696	744	101	2,071	2,107	2,088	196	4,781	10,899	5,861
52 weeks	23	29,927	27,892	38,034	62	66,425	292,271	157,823	630	799,212	302,242	380,378

Division and State	Meningitis, meningococcus				Poliomyelitis				Scarlet fever			
	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median
NEW ENG.												
Maine	0	0	1	0	0	0	0	0	164	27	20	19
New Hampshire	0	0	0	0	0	0	0	0	102	10	17	12
Vermont	0	0	0	0	0	0	0	0	123	9	2	8
Massachusetts	1.2	1	2	1	0	0	0	0	146	124	252	179
Rhode Island	0	0	0	0	0	0	0	0	61	8	18	12
Connecticut	3	1	0	0	0	0	0	0	129	43	69	49
MID. ATL.												
New York	2	5	12	8	0	0	1	1	146	364	449	449
New Jersey	0	0	2	2	1.2	1	0	1	109	91	114	114
Pennsylvania [2]	1	2	5	4	0	0	1	1	111	217	430	361

See footnotes at end of table.

Cases of certain diseases reported by telegraph by State health officers for the week ended December 31, 1938, rates per 100,000 population (annual basis), and comparison with corresponding week of 1937 and 5-year median—Continued

Division and State	Meningitis, meningococcus				Poliomyelitis				Scarlet fever			
	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median
E. NO. CEN.												
Ohio	0	0	8	4	0	0	0	0	254	328	332	365
Indiana	0	0	0	1	0	0	0	0	248	165	134	167
Illinois	2	3	1	7	2	3	4	3	25	38	566	499
Michigan [3]	2.2	2	1	2	0	0	4	0	500	463	564	276
Wisconsin	0	0	0	1	0	0	1	0	342	192	170	258
W. NO. CEN.												
Minnesota	0	0	1	1	0	0	2	1	224	114	98	106
Iowa	0	0	0	1	0	0	0	0	168	82	141	102
Missouri	2.6	2	2	2	0	0	1	0	119	91	255	104
North Dakota	0	0	1	1	0	0	0	0	74	10	18	31
South Dakota	0	0	1	0	0	0	1	0	173	23	30	30
Nebraska	0	0	1	0	0	0	1	1	80	21	33	35
Kansas	0	0	1	1	0	0	0	0	414	148	233	116
SO. ATL.												
Delaware	0	0	0	0	0	0	0	0	160	8	14	7
Maryland [3]	0	0	3	2	0	0	0	0	90	29	35	59
Dist. of Col.	0	0	0	1	8	1	0	0	42	5	15	15
Virginia	4	2	3	2	0	0	0	1	75	39	67	67
West Virginia	0	0	3	3	0	0	0	0	134	48	44	73
North Carolina [3] [4]	3	2	2	1	0	0	0	0	64	43	53	53
South Carolina [3]	6	2	0	0	8	3	0	0	25	9	2	8
Georgia [3]	0	0	0	2	1.7	1	0	0	19	11	19	19
Florida [3]	6	2	3	1	3	1	1	1	31	10	20	9
E. SO. CEN.												
Kentucky	5	3	5	5	1.8	1	1	0	154	86	55	55
Tennessee	0	0	1	1	0	0	3	0	94	52	36	38
Alabama [3]	9	5	11	1	1.8	1	1	1	67	37	10	12
Mississippi [3] [5]	2.6	1	1	1	2.6	1	4	1	18	7	15	15
W. SO. CEN.												
Arkansas	0	0	0	0	8	3	3	1	51	20	46	14
Louisiana [3]	2.4	1	3	1	0	0	0	0	20	8	15	15
Oklahoma	4	2	4	3	0	0	0	0	121	59	42	42
Texas [3]	0	0	2	2	2.5	3	0	1	88	104	75	110
MOUNTAIN												
Montana	0	0	0	0	0	0	0	0	116	12	16	16
Idaho	21	2	0	0	0	0	0	0	42	4	21	21
Wyoming	0	0	0	0	0	0	0	0	222	10	27	15
Colorado	0	0	1	0	0	0	1	0	239	49	31	31
New Mexico	0	0	0	0	0	0	0	0	259	21	12	17
Arizona	38	3	0	0	0	0	0	0	38	3	14	14
Utah [3]	0	0	0	0	0	0	0	0	151	15	100	53
PACIFIC												
Washington	0	0	0	0	3	1	0	0	164	52	40	40
Oregon	0	0	1	0	0	0	0	0	279	55	37	38
California [3]	1.7	2	1	3	0	0	5	4	113	133	171	171
Total	1.7	43	83	75	0.8	20	35	35	141	3,497	4,977	4,977
52 weeks	2.2	2,824	5,390	5,390	1.3	1,710	9,451	7,276	145	186,532	223,425	223,425

See footnotes at end of table.

Cases of certain diseases reported by telegraph by State health officers for the week ended December 31, 1938, rates per 100,000 population (annual basis), and comparison with corresponding week of 1937 and 5-year median—Continued.

Division and State	Smallpox				Typhoid and paratyphoid fever				Whooping cough		
	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan 1, 1938, cases
NEW ENG.											
Maine	0	0	0	0	0	0	1	3	256	42	56
New Hampshire	0	0	0	0	0	0	0	0	0	0	8
Vermont	0	0	0	0	0	0	0	0	858	63	16
Massachusetts	0	0	0	0	0	0	3	2	148	126	89
Rhode Island	0	0	0	0	0	0	0	0	153	20	25
Connecticut	0	0	0	0	0	0	0	0	129	43	24
MID. ATL.											
New York	0	0	0	0	2	6	9	9	177	440	253
New Jersey	0	0	0	0	4	3	3	4	376	313	117
Pennsylvania [3]	0	0	0	0	5	9	6	7	129	252	210
E. NO. CEN.											
Ohio	5	6	1	1	2	3	4	4	59	76	110
Indiana	57	38	69	5	2	1	1	1	5	3	12
Illinois	3	5	44	4	1	1	3	4	208	315	76
Michigan [3]	4	4	0	1	6	6	1	1	287	266	200
Wisconsin	9	5	1	16	2	1	0	0	481	270	103
W. NO. CEN.											
Minnesota	37	19	47	8	2	1	1	1	14	7	24
Iowa	25	12	19	7	12	6	0	0	37	18	15
Missouri	26	20	36	5	4	3	11	6	14	11	169
North Dakota	0	0	7	5	0	0	0	0	52	7	13
South Dakota	68	9	3	5	0	0	0	0	15	2	9
Nebraska	23	6	0	10	4	1	0	0	27	7	3
Kansas	0	0	7	6	0	0	1	1	31	11	47
SO. ATL.											
Delaware	0	0	0	0	0	0	1	0	0	0	5
Maryland [3]	0	0	0	0	9	3	5	4	102	33	46
Dist. of Col	0	0	0	0	0	0	1	1	100	12	8
Virginia	0	0	0	0	0	0	9	7	119	62	85
West Virginia	3	1	0	0	3	1	1	1	101	36	12
North Carolina [3 4]	0	0	0	0	4	3	8	6	215	144	192
South Carolina [3]	0	0	0	0	19	7	1	1	70	25	14
Georgia [3]	2	1	0	0	12	7	1	3	27	16	22
Florida [3]	0	0	0	0	9	3	4	2	28	9	4
E. SO. CEN.											
Kentucky	0	0	0	0	7	4	0	3	9	5	32
Tennessee	0	0	5	2	4	2	2	5	27	15	35
Alabama [3]	0	0	6	1	11	6	4	7	61	34	0
Mississippi [3 5]	0	0	0	0	3	1	2	2	----	----	----
W. SO. CEN.											
Arkansas	18	7	5	4	5	2	10	8	25	10	38
Louisiana [3]	0	0	0	0	10	4	6	4	12	5	7
Oklahoma	45	22	3	1	4	2	1	5	20	10	4
Texas [3]	6	7	2	3	3	4	9	13	44	52	142
MOUNTAIN											
Montana	48	5	10	10	0	0	3	0	174	18	34
Idaho	63	6	34	2	32	3	0	0	21	2	60
Wyoming	0	0	1	1	0	0	0	0	67	3	5
Colorado	5	1	8	2	19	4	0	0	122	25	4
New Mexico	0	0	0	0	12	1	4	4	161	13	15
Arizona	101	8	0	0	38	3	2	2	51	4	9
Utah [3]	0	0	0	0	0	0	0	0	151	15	10

See footnotes at end of table.

Cases of certain diseases reported by telegraph by State health officers for the week ended December 31, 1938, rates per 100,000 population (annual basis), and comparison with corresponding week of 1937 and 5-year median—Continued

Division and State	Smallpox				Typhoid and paratyphoid fever				Whooping cough		
	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases	1933–37 median	Dec. 31, 1938, rate	Dec. 31, 1938, cases	Jan. 1, 1938, cases
PACIFIC											
Washington	6	2	11	11	0	0	0	1	31	10	73
Oregon	25	5	6	5	0	0	1	1	56	11	10
California [1]	7	8	20	6	3	3	10	8	53	63	179
Total	8	197	345	152	4	104	129	149	120	2,924	2,630
52 weeks	11	14,397	11,110	7,459	11	14,235	15,059	17,491	166	210,213	------

[1] New York City only.
[2] Typhus fever, week ended December 31, 1938, 42 cases as follows: Pennsylvania, 1; North Carolina, 4; South Carolina, 4; Georgia, 10; Florida, 2; Alabama, 10; Mississippi, 1; Louisiana, 1; Texas, 8; California, 1.
[3] Period ended earlier than Saturday.
[4] Rocky Mountain spotted fever, week ended December 31, 1938, North Carolina, 1 case.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningitis, meningococcus	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid and paratyphoid fever
October 1938										
South Carolina	------	363	1,299	1,931	14	124	2	67	2	43
November 1938										
North Dakota	0	21	23	------	1,090	------	0	77	28	6
South Carolina	------	260	1,081	747	29	112	2	58	0	13
Utah	0	15	28	------	232	------	0	77	1	2

October 1938

	Cases
South Carolina:	
Chickenpox	18
Dengue	4
Diarrhea	486
German measles	9
Hookworm disease	141
Mumps	35
Ophthalmia neonatorum	6
Rabies in animals	27
Septic sore throat	4
Typhus fever	37
Undulant fever	5
Whooping cough	223

November 1938

	Cases
Chickenpox:	
North Dakota	71
South Carolina	40
Utah	485

November 1938—Continued

	Cases
Dysentery:	
North Dakota (bacillary)	1
North Dakota (unspecified)	1
Encephalitis, epidemic or lethargic:	
North Dakota	1
German measles:	
North Dakota	1
South Carolina	8
Utah	10
Hookworm disease:	
South Carolina	73
Mumps:	
North Dakota	1
South Carolina	13
Utah	334
Ophthalmia neonatorum:	
South Carolina	4
Rabies in animals:	
South Carolina	28

November 1938—Continued

	Cases
Rocky Mountain spotted fever:	
Utah	2
Septic sore throat:	
North Dakota	1
Utah	1
Trachoma:	
North Dakota	2
Utah	8
Tularaemia:	
Utah	6
Typhus fever:	
South Carolina	11
Undulant fever:	
North Dakota	1
Utah	3
Vincent's infection:	
North Dakota	1
Whooping cough:	
North Dakota	30
South Carolina	122
Utah	83

WEEKLY REPORTS FROM CITIES

City reports for week ended December 24, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	223	451	91	1,423	868	1,428	18	362	28	975	----
Current week [1]	121	152	46	1,087	596	1,062	22	331	12	1,166	----
Maine:											
Portland	0	----	0	0	0	2	0	0	0	2	22
New Hampshire:											
Concord	0	----	0	0	0	0	0	0	0	0	9
Nashua	0	----	0	0	0	0	0	0	0	1	5
Vermont:											
Barre	0	----	0	0	0	3	0	1	0	2	2
Burlington	0	----	0	0	0	0	0	0	0	2	12
Rutland	0	----	0	0	0	0	0	0	0	0	9
Massachusetts:											
Boston	0	----	0	26	6	34	0	4	0	24	204
Fall River	0	----	0	0	4	0	0	1	0	0	32
Springfield	0	----	0	46	0	2	0	0	0	4	32
Worcester	0	----	0	0	8	3	0	2	0	12	59
Rhode Island:											
Pawtucket	0	----	0	1	3	1	0	0	0	0	22
Providence	0	3	0	0	7	5	0	3	0	33	69
Connecticut:											
Bridgeport	2	1	0	0	2	3	0	1	0	0	36
Hartford	0	1	0	8	4	2	0	1	0	7	37
New Haven	0	1	0	1	1	3	0	0	0	18	39
New York:											
Buffalo	0	----	1	33	8	36	0	5	0	14	126
New York	15	14	4	31	86	65	0	64	3	117	1,405
Rochester	0	1	0	7	5	3	0	1	0	17	60
Syracuse	1	----	0	0	2	5	0	0	0	35	40
New Jersey:											
Camden	0	----	0	0	3	3	0	1	0	3	34
Newark	----	----	----	----	----	----	----	----	----	----	----
Trenton	0	1	0	0	4	5	0	1	0	8	32
Pennsylvania:											
Philadelphia	4	5	5	4	31	42	0	28	5	82	501
Pittsburgh	5	2	1	2	13	27	0	6	0	17	161
Reading	0	----	0	1	3	0	0	0	0	1	19
Scranton	0	----	----	1	----	16	0	----	0	3	----
Ohio:											
Cincinnati	5	----	0	2	5	8	0	3	0	0	121
Cleveland	5	14	2	2	20	49	0	11	1	58	205
Columbus	2	1	1	0	4	7	0	6	0	3	94
Toledo	1	----	0	1	2	12	0	1	0	15	68
Indiana:											
Anderson	0	----	0	0	0	6	0	0	0	0	12
Fort Wayne	0	----	0	1	1	4	0	0	0	0	22
Indianapolis	1	----	1	2	22	37	14	3	0	5	127
South Bend	----	----	----	----	----	----	----	----	----	----	----
Terre Haute	2	----	0	0	0	5	0	0	0	0	20
Illinois:											
Alton	0	----	0	0	3	0	0	0	0	0	7
Chicago	14	10	2	9	55	160	0	48	1	231	723
Elgin	0	----	0	0	4	3	0	0	0	0	12
Moline	0	----	0	0	0	0	0	0	0	0	7
Springfield	0	----	0	0	2	1	0	1	0	0	16
Michigan:											
Detroit	8	1	1	10	14	118	0	8	1	109	281
Flint	0	----	0	103	3	42	0	0	0	0	19
Grand Rapids	0	----	1	1	2	14	0	1	0	6	29
Wisconsin:											
Kenosha	0	----	0	1	1	5	0	0	0	16	12
Madison	1	----	0	0	0	2	0	0	0	9	18
Milwaukee	0	1	1	9	4	55	0	3	0	149	98
Racine	0	----	0	2	0	4	0	0	0	5	11
Superior	0	----	2	0	2	5	0	0	0	1	15

[1] Figures for Newark, N. J.; South Bend, Ind.; Charleston, W. Va., and Little Rock, Ark., estimated: reports not received.

City reports for week ended December 24, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0		0	1	0	9	0	2	0	3	18
Minneapolis	0		0	43	7	14	0	3	0	2	107
St. Paul	0		0	171	0	10	0	0	0	3	64
Iowa:											
Cedar Rapids	0			1		0	0		0	0	
Davenport	1			0		5	1		0	0	
Des Moines	0		0	0	0	15	0	0	0	0	32
Sioux City	0			117		1	0		0	3	
Waterloo	4			0		2	0		0	1	
Missouri:											
Kansas City	2		0	1	14	17	1	1	0	1	104
St. Joseph	0		0	0	3	5	0	0	0	0	26
St. Louis	3		0	0	17	24	1	9	0	5	181
North Dakota:											
Fargo	0		0	15	1	1	0	0	0	0	5
Grand Forks	1			0		1	0		0	0	
Minot	0		0	17	0	2	0	0	0	0	4
South Dakota:											
Aberdeen	1			0		0	0		0	0	
Nebraska:											
Lincoln	1			0		3	0		0	0	
Omaha	0		0	1	3	3	1	1	0	0	65
Kansas:											
Lawrence	0		0	0	1	2	0	0	0	0	4
Topeka	0		0	0	0	10	0	0	0	4	6
Wichita	0		0	0	0	6	0	1	0	0	14
Delaware:											
Wilmington	0		0	0	1	2	0	0	0	1	27
Maryland:											
Baltimore	0	6	2	88	25	11	0	11	0	16	250
Cumberland	0		0	0	2	1	0	0	0	0	17
Frederick	0	1	0	0	1	3	0	0	0	0	11
Dist. of Col.:											
Washington	6	2	0	3	9	7	0	8	0	19	173
Virginia:											
Lynchburg	0		0	0	0	1	0	1	0	13	8
Norfolk	2	7	0	0	6	0	0	0	0	3	43
Richmond	0		1	0	8	2	0	3	0	0	50
Roanoke	0		0	0	1	4	0	2	0	0	11
West Virginia:											
Charleston											
Huntington	1			0		1	1		0	0	
Wheeling	0		0	0	1	0	0	0	0	1	11
North Carolina:											
Gastonia	0			0		0	0		0	2	
Raleigh	0		0	0	2	0	0	0	0	0	10
Wilmington	2		0	0	1	0	0	0	0	0	14
Winston-Salem	0		0	15	1	2	0	2	0	0	14
South Carolina:											
Charleston	0	8	0	0	2	2	0	1	0	0	22
Florence	1		0	0	3	0	0	1	0	0	12
Greenville	1		0	0	0	1	0	0	0	0	3
Georgia:											
Atlanta	0	21	1	1	5	11	0	5	1	0	66
Brunswick	0		0	0	2	1	0	0	0	0	9
Savannah	0	29	2	0	1	0	0	1	0	7	29
Florida:											
Miami	0		0	1	1	1	0	2	0	0	46
Tampa	1	1	1	1	4	3	0	1	0	1	34
Kentucky:											
Ashland	1		0	0	0	0	0	0	0	0	10
Covington	1		0	0	3	1	0	0	0	0	18
Lexington	0		0	0	2	1	0	2	0	0	21
Louisville	1		0	1	2	14	0	0	0	4	45
Tennessee:											
Knoxville	1		0	0	4	3	0	0	0	0	25
Memphis	0		0	0	4	2	0	3	0	6	90
Nashville	2		0	0	9	2	0	5	0	5	60
Alabama:											
Birmingham	0	7	1	2	9	3	0	3	0	0	50
Mobile	0		1	0	2	4	0	0	0	1	28
Montgomery	0			0		0	0		0	0	

City reports for week ended December 24, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	2			0		0	0		0	0	
Little Rock											
Louisiana:											
New Orleans	5	5	6	8	26	11	0	13	0	15	188
Shreveport	0		0	0	9	2	0	0	0	0	43
Oklahoma:											
Oklahoma City	0	3	0	0	6	0	0	0	0	0	48
Tulsa	0			1		7	0		1	0	
Texas:											
Dallas	2	4	4	0	6	8	0	3	0	1	63
Fort Worth	2		0	2	6	5	0	1	0	0	35
Galveston	1		0	0	1	2	0	0	0	0	11
Houston	3		1	0	5	3	1	6	0	2	64
San Antonio	1	3	1	0	10	2	0	4	0	0	66
Montana:											
Billings	0		0	9	0	1	0	0	0	1	5
Great Falls	0		0	1	2	4	0	0	0	0	12
Helena	0		0	1	0	0	0	0	0	0	6
Missoula	0		0	0	1	1	0	0	0	0	3
Idaho:											
Boise	0		0	0	0	1	0	0	0	0	6
Colorado:											
Colorado Springs	0		0	0	0	2	0	0	0	3	11
Denver	9		1	2	8	2	0	5	0	13	101
Pueblo	0		0	0	4	6	0	0	0	0	8
New Mexico:											
Albuquerque	0		0	0	0	0	0	5	0	2	11
Utah:											
Salt Lake City	0		0	2	8	7	0	0	0	4	52
Washington:											
Seattle	1		1	1	9	10	0	6	0	0	119
Spokane	0		0	4	0	1	0	0	0	1	23
Tacoma	0		0	0	0	4	0	0	0	1	27
Oregon:											
Portland	0		1	0	3	11	0	2	0	1	74
Salem	0			0		10	0		0	0	
California:											
Los Angeles	17	7	1	7	25	55	0	9	0	7	369
Sacramento	0		0	2	1	4	4	2	0	0	28
San Francisco	2	1	0	405	16	12	0	12	0	14	173

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
New York:				Florida:			
Buffalo	1	1	0	Miami	0	1	0
New York	3	0	1	Kentucky:			
Pennsylvania:				Lexington	1	0	0
Philadelphia	1	0	0	Tennessee:			
Ohio:				Memphis	0	1	0
Cleveland	1	0	0	Alabama:			
Illinois:				Birmingham	1	0	0
Chicago	1	0	0	Louisiana:			
Michigan:				Shreveport	0	1	0
Detroit	1	1	0	Texas:			
Missouri:				Dallas	0	0	1
St Joseph	0	2	0	Washington:			
Maryland:				Spokane	0	0	1
Baltimore	1	0	0	California:			
South Carolina:				Los Angeles	1	0	0
Charleston	0	0	6				
Georgia:							
Savannah	0	0	2				

Encephalitis, epidemic or lethargic.—Cases: Boston, 2; Philadelphia, 1; Louisville, 2.
Pellagra.—Cases: Atlanta, 2; Savannah, 1.
Typhus fever.—Cases: Atlanta, 2; Savannah, 2; Galveston, 1; San Antonio, 1; Los Angeles, 3.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended December 17, 1938.—During the 2 weeks ended December 17, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada, as follows:

Disease	Prince Edward Island	Nova Scotia[1]	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				2	3	1			1	7
Chickenpox		17	18	528	692	59	143	53	207	1,717
Diphtheria		12	9	176	8	17	6	4		232
Dysentery					4				2	6
Erysipelas				7	8	5		1	4	25
Influenza		9	1		17				71	98
Measles		7		237	1,049	77	8	3	19	1,400
Mumps		6	16		78	39		13	10	162
Paratyphoid fever					2					2
Pneumonia		1			55			3	30	89
Poliomyelitis					3	1	1			5
Scarlet fever		18	29	219	392	48	69	62	43	880
Smallpox					1		3			4
Trachoma							7			7
Tuberculosis	3	50	12	131	87	5	43	8	41	380
Typhoid fever		7	2	29	10	2	6	6	1	63
Undulant fever			2	1	1					4
Whooping cough		7	6	221	606	51	3		62	959

[1] For 2 weeks ended December 21, 1938.

ITALY

Communicable diseases—4 weeks ended October 9, 1938.—During the 4 weeks ended October 9, 1938, cases of certain communicable diseases were reported in Italy as follows:

Disease	Sept. 12-18	Sept. 19-25	Sept. 26-Oct. 2	Oct. 3-9
Anthrax	37	38	37	33
Cerebrospinal meningitis	13	5	6	11
Chickenpox	49	52	42	61
Diphtheria	472	495	493	532
Dysentery	74	43	51	39
Hookworm disease	36	38	11	29
Lethargic encephalitis			1	1
Measles	350	448	359	307
Mumps	52	53	50	73
Paratyphoid fever	229	221	175	164
Pellagra	4	2	1	2
Poliomyelitis	54	48	63	73
Puerperal fever	32	23	33	42
Scarlet fever	209	206	244	227
Typhoid fever	1,492	1,490	1,108	1,096
Undulant fever	57	35	43	57
Whooping cough	149	184	156	165

JAMAICA

Communicable diseases—4 weeks ended December 24, 1938.—During the 4 weeks ended December 24, 1938, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis	1		Lethargic encephalitis		1
Chickenpox	1	10	Puerperal fever		4
Diphtheria	5	4	Tuberculosis	30	70
Dysentery	3		Typhoid fever	5	39
Leprosy		3			

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for December 30, 1938, pages 2298-2309. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Smallpox

Mexico.—During the month of October 1938, smallpox was reported in Mexico as follows: Aguascalientes, Aguascalientes State, 6 cases, 2 deaths; Pachuca, Hidalgo State, 30 cases.

Typhus Fever

Mexico.—During the month of October 1938, typhus fever was reported in Mexico as follows: Aguascalientes, Aguascalientes State, 1 case; Mexico, D. F., 10 cases, 2 deaths; Oaxaca, Oaxaca State, 2 cases; Pachuca, Hidalgo State, 5 cases; Puebla, Puebla State, 2 cases; Queretaro, Queretaro State, 1 case; San Luis Potosi, San Luis Potosi State, 2 cases; Toluca, Mexico State, 6 cases, 1 death.